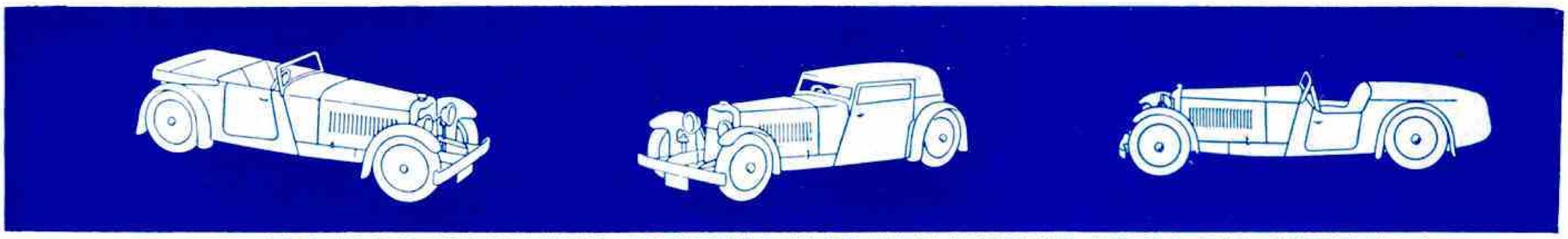
VOL. XX. No. 5. MAY 1935

MECCANO MAGAZINE

CASING FOR GIANT NIAGARA VALVE
(see page 284)

6D.



THE ABOVE ARE EXAMPLES OF MODELS MADE WITH MECCANO MOTOR CAR OUTFIT No. 1.

MECCANO

MOTOR CAR CONSTRUCTOR

MECCAUTO 538189

Perfect miniature reproductions of many different types of car can be built with these splendid Motor Car Constructor Outfits, including sports four-seaters, speed cars, sports coupés and others. All the models are driven by means of a powerful clockwork motor (included in the Outfit) giving a long, speedy and realistic run on each winding. The parts are finished in rich enamel and nickel-plate, the complete Outfits being master-pieces of miniature automobile craftsmanship.

Now is the time to get a Meccano Motor Car Outfit. You will never grow tired of building and running the superb models that you will be able to build.

No. 1 MECCANO MOTOR CAR CONSTRUCTOR OUTFIT

The motor car models that can be built with this Outfit are the finest you ever saw. Look at the examples illustrated at the top of this page and think of the fun you could have building these and other types equally graceful and realistic.

No. 1 Outfit is available in four different colour combinations—Red and Light Blue, Light Blue and Cream, Green and Yellow, and Cream and Red. It is supplied complete with powerful Clockwork Motor.

Price **13/6**

No. 2 MECCANO MOTOR CAR CONSTRUCTOR OUTFIT

Larger models of a superior type can be built with No. 2 Outfit. They are perfectly designed, beautifully finished and the most attractive examples of constructional engineering ever invented for the delight of boys. Their handsome and realistic appearance may be judged from the illustrations below.

No. 2 Outfit is available in four different colour combinations—Red and Light Blue, Light Blue and Cream, Green and Yellow, and Cream and Red. A powerful Clockwork Motor that gives a run of 150 feet on one winding is included.

Price **25/-**

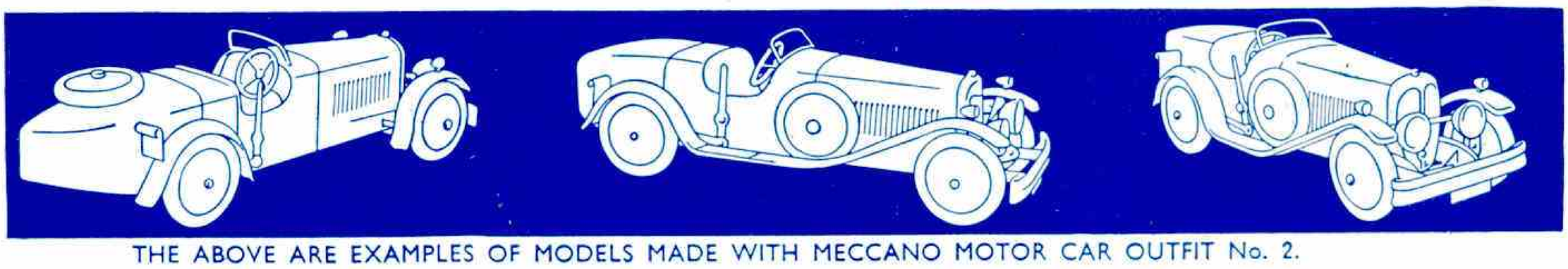
IMPORTANT.—It should be noted that No. 1 Motor Car Outfit parts cannot be used in conjunction with those of No. 2 Outfit.

Manufactured by

MECCANO LTD. - BINNS ROAD - LIVERPOOL 13

Meccano Motor Car Constructor Outfit No. 1

Meccano Motor Car Constructor Outfit No. 2



THE ABOVE ARE EXAMPLES OF MODELS MADE WITH MECCANO MOTOR CAR OUTFIT No. 2.

Hamleys News

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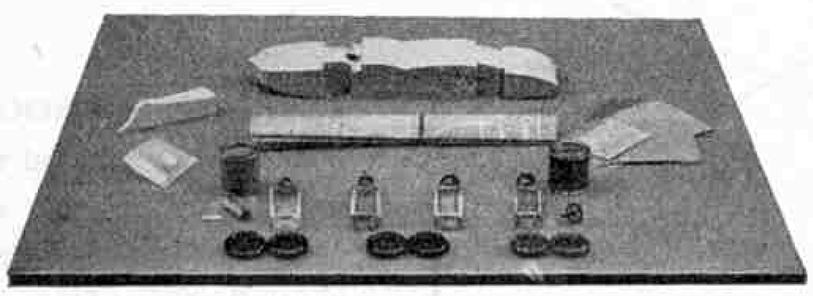
200-202, REGENT STREET, LONDON, W.1 **OUR ONLY ADDRESS**

Number Twenty-five *May, 1935*

MAKE YOUR OWN SCALE MODEL "BLUEBIRD"

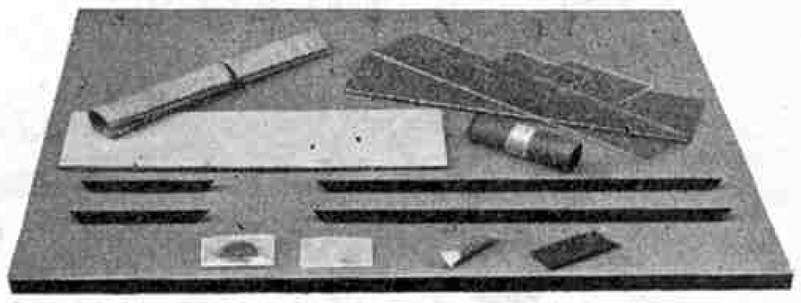
Made-up Scale Model - - Price **2 gns.**
„ Showcase - - - „ **12/6**

We've all been reading lately about the latest world record put up by Sir Malcolm Campbell in his new "Bluebird." Now every boy can become the proud possessor of a true scale model of this famous racing car—the fastest car on earth! And not only can you own a "Bluebird"—you can make it yourself with the greatest of ease!



"BLUEBIRD" CAR CONSTRUCTIONAL SET. A complete kit of parts which will enable you to build a perfect scale model of Sir Malcolm Campbell's famous "Bluebird." Something for any boy to be really proud of. Price complete **21/-**

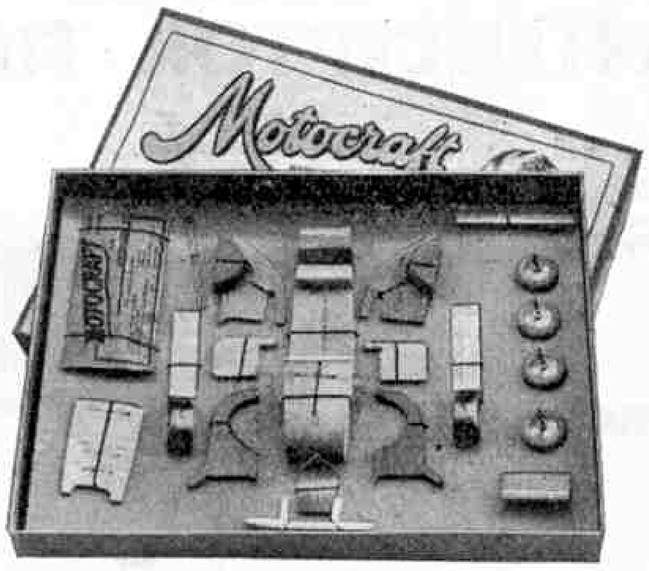
TRAFFIC LIGHTS
Correct colour signals given by moving automatic switching device. Price, complete with battery, **4/6**



CONSTRUCTIONAL GLASS SHOWCASE
Specially made to hold the "Bluebird" Racing Car. Complete with mouldings and blue print. Price **7/6**

Write for our 1935 Summer Sports and Games List, illustrating the latest sports equipment and everything for out-door play. Post free on request.

PETROL PUMP
Working model petrol pump. Realistic operation. Complete with water container. Price **5/6**



"MOTOCRAFT" AIRFLOW CHRYSLER
Construct a real scale model of this famous car. All fittings complete and ready for easy assembling. Scale ⅜ in. to 1 ft. Price **4/6.** Also: Aston Martin 1½ litre model, **2/6,** and M.G. "Q" type Midget, **2/6.**

SECRETS of SCALE MODEL AIRCRAFT DESIGN

The sixth of an interesting series of articles by the well-known designer responsible for the construction of the most perfect of all scale model aeroplanes, the "FROG" and "PUSS-MOTH"

6

The Value of "FROG" Service.

The manufacturers of "FROG" model Aircraft realised from the beginning that a thoroughly efficient repairs and reconditioning service was vital to the successful marketing of their models, and a special spares and repair department was started on the Company's premises. Each individual case is treated as a separate item and given individual care by an expert. Repairs are done at very reasonable charges.

Answering questions by "FROG" pilots.

A great deal of time and money has been spent on studying the difficulties encountered in flying model aircraft by the average pilot, and experts are employed to give clear and concise answers to any question asked by owners of "FROG" aircraft.

Join the "FROG" Club.

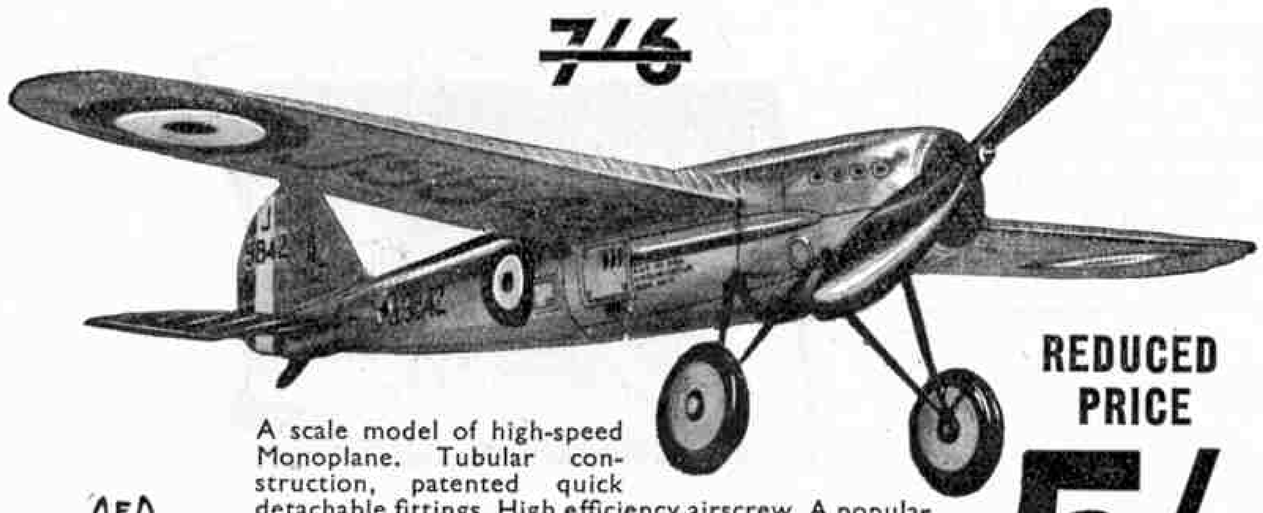
The "FROG" Club, which was organised specially to encourage air-mindedness among the young pilots of Great Britain, now has nearly 10,000 members. Such a membership speaks for itself of the value of the club and the fun that can be obtained by those who join it. If the reader, or any friend of his has not yet joined the "FROG" Club, he would be well advised to get into touch with Lines Brothers Ltd., at the address below.

PUSS-MOTH MONOPLANE

A magnificent scale model of the famous record-breaking light aeroplane. All metal fuselage with bulk-head reinforcement, hollow wings of special design and construction. Dual motor coupled gear-box, transparent cabin and roof lights. "FROG" patent quick detachable fittings. Complete with high-speed winder-box, spare motor, insertor rod, gear box oil, elastic lubricant and illustrated flying manual. Wing span, 18 ins. Flies 600 ft. PRICE **17/6**

"F.R.O.G." INTERCEPTOR FIGHTER

~~7/6~~



A scale model of high-speed Monoplane. Tubular construction, patented quick detachable fittings. High efficiency airscrew. A popular machine for realistic stunting. The "FROG" is sold complete with spare motors, lubricant and gear-box oil, patent high-speed winder-box and illustrated flying manual. Wing span, 11½ ins. Flies 300 ft.

Designed and made by International Model Aircraft.

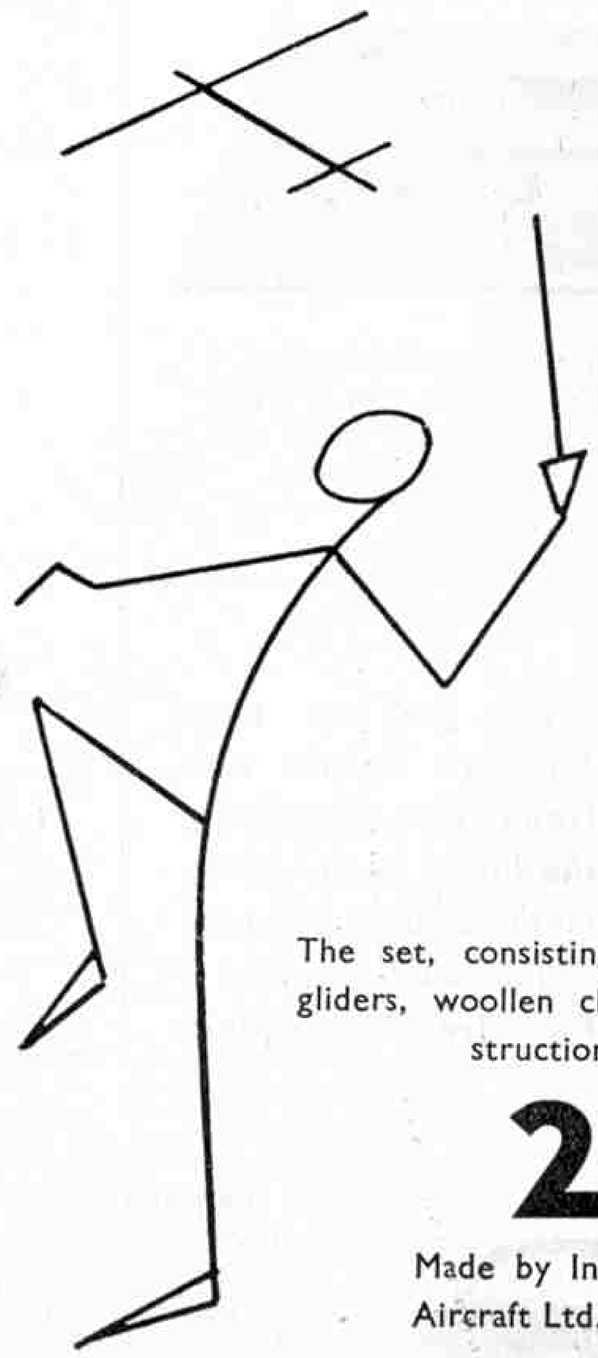
REDUCED PRICE

5/-

TRADE MARK REGD.

The "ELECTROSTATIC" AEROPLANE

Made by the "F.R.O.G." People



The makers of "FROG" aircraft are delighted to be able to tell you of their thrilling new invention, the "Electrostatic" aeroplane.

By rubbing the ebonite wand supplied with the set, these little gliders can be made to "loop-the-loop" do "Immelmann" turns and all kinds of real aerobatics. Simple—and very good fun.

The set, consisting of ebonite wand, 12 gliders, woollen cloth and booklet of instructions, costs only

2/6

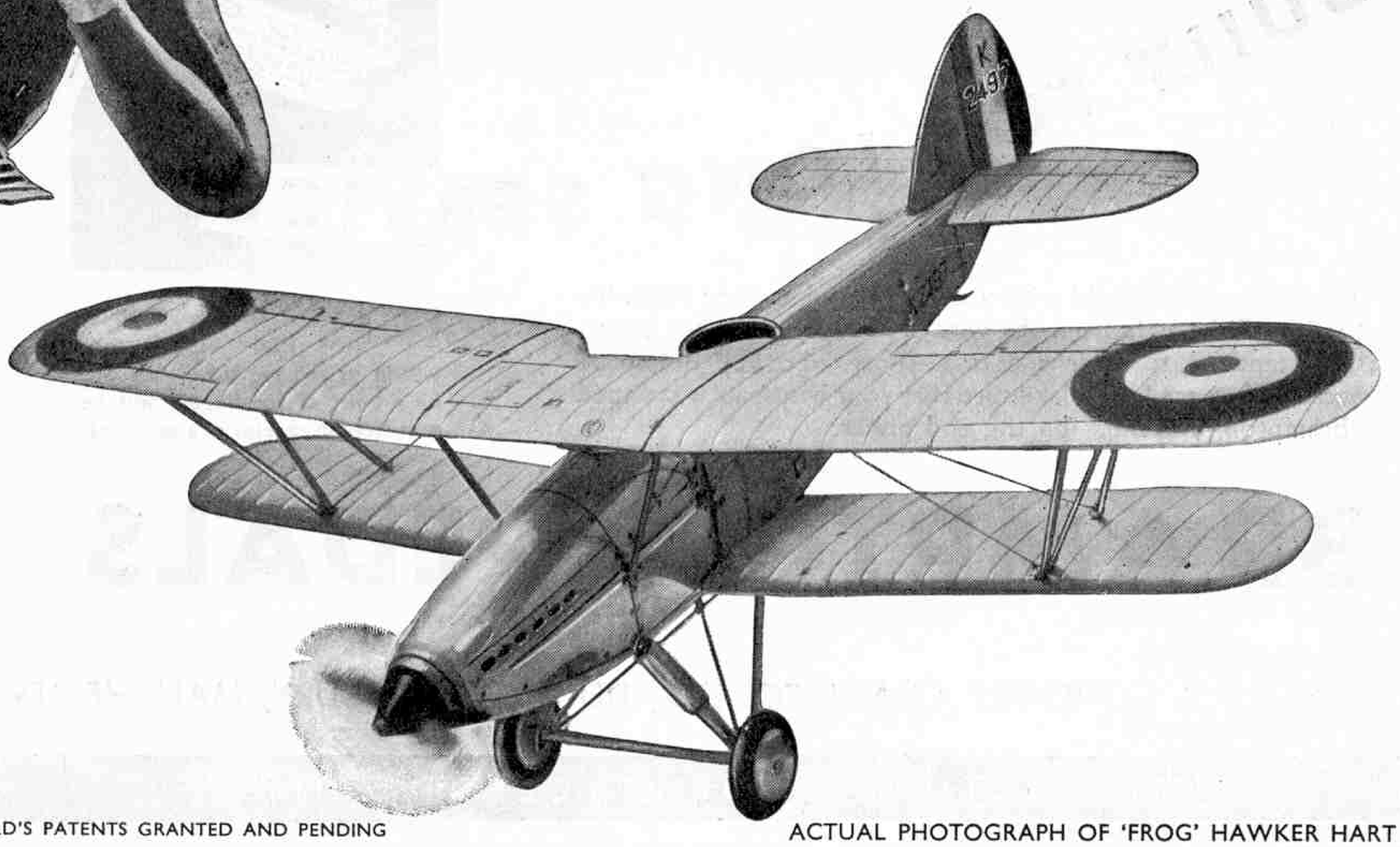
Made by International Model Aircraft Ltd., London, S.W.19.

Look out for the Meteor—Coming Soon!

Sole Concessionaires:

LINES BROTHERS LTD., TRI-ANG WORKS, MORDEN ROAD, LONDON, S.W.19

Seen the new HAWKER HART? It's made by the FROG people!

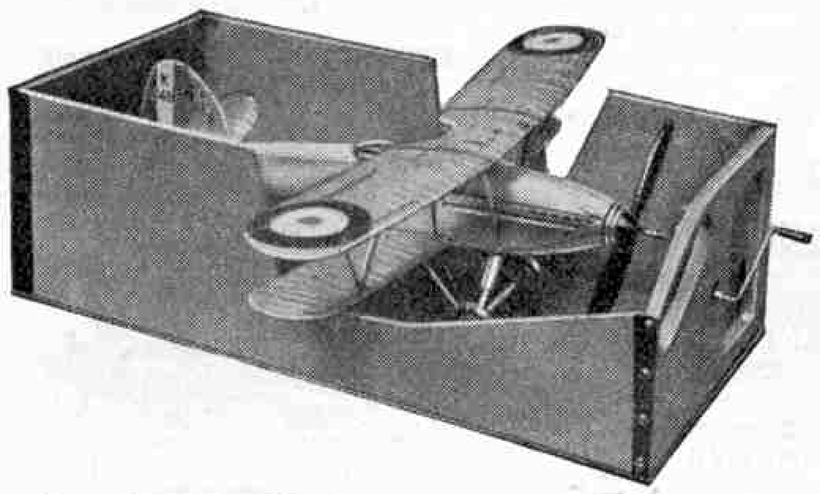


WORLD'S PATENTS GRANTED AND PENDING

ACTUAL PHOTOGRAPH OF 'FROG' HAWKER HART

The most famous military aeroplane in the world—the most formidable aerial weapon ever known—there's little need to tell you the name of the Hawker Hart. And now you may own and fly an almost exact reproduction in miniature of this wonderful fighter! The very latest 'Frog'—the flying scale model Hawker Hart—is waiting for you at your local shop to-day!

This 'Frog' Hawker Hart is designed (like the real machine) for short distance bombing. Every detail has been carefully considered to give complete realism to this wonder 'plane. There is actually a miniature Vickers-Scarff gun mounting ring before the observer's cockpit and a life-like instrument board in the pilot's cockpit. And the flying performance of this new machine is remarkable. Come and see the Hawker Hart now!



Complete with extra strong HIGH-SPEED WINDER-BOX, lubricant for Gearbox and motors, triple insertor rod, spare motors and profusely illustrated flying manual. **42/-**

SPECIFICATION

Telescopic spring-loaded under carriage. Unique fuselage built up on a reinforced structure of steel, duralumin and timber, covered either with aluminium, alloy sheet or a cellulose-paper—the only material capable of reproducing the exact form, shape and appearance of full-size aeroplane parts. Wings reinforced with internal ribbing and attached to fuselage with quick detachable fittings. Triple, 4-strand motor and watch type gearbox. Precision cut airscrew and spinner.

Wing Span, 18.75 ins. Overall Length, 15.36 ins.

Average Length of Flight, 700 ft.

Owners of a 'FROG,' PUSS MOTH or HAWKER HART are eligible for the handsome badges, price 6d. each, when the proficiency tests have been passed.

ON SALE AT ALL GOOD TOY SHOPS AND STORES

Made by INTERNATIONAL MODEL AIRCRAFT LTD., LONDON, S.W.19

Sole Concessionaires: LINES BROS. LTD., *Tri-ang Works, Morden Road, Merton, S.W.19*

Rather! And I've already won my FROG Pilot Badge with it

BUILT FOR LONG SERVICE

It's no use getting wild with your pedals when they stick. It's too late. Take a tip from the wise cyclists who buy the pedals that stand up to wear and tear—those who buy Brampton because they are best. Make sure that your next pair is stamped "Brampton, England," on the end plates.

FREE A simple SPRING CLIP TOOL that will fit or remove the spring clip by a twist of the fingers will be sent free on receipt of a postcard.

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THE RENOLD & COVENTRY CHAIN CO. LTD., DEPT. G3, DIDSBURY, MANCHESTER

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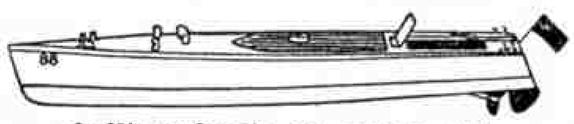
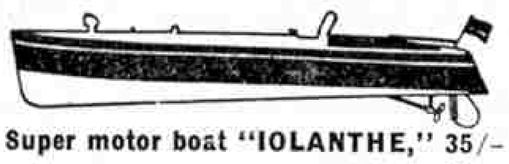
JUBILEE BOATS

THIS SPRING we celebrate the 25th anniversary of our registration as a limited company, and in honour of our Jubilee have prepared a specially fine series of spring boats and fittings.

YACHTS like "ENDEAVOUR" (a scale model of Mr. T. O. M. Sopwith's famous American challenger) and our new "SOUTHWOLD" racer. Cabin cruisers like "MARGARET ROSE," and motor boats like "IOLANTHE" and the 21/– "RALEIGH," and best of all our new speed boat "STREAMLINIA," which you can make yourself.



Swifta series No. 88, electric, 25/–



Super motor boat "IOLANTHE," 35/–

Make your choice from this wonderful array described in our new Ships' Catalogue S.17, just published. Model makers will find new fittings, blue prints, and sets of parts in new S.17, 6d. post free. Send for your copy now.

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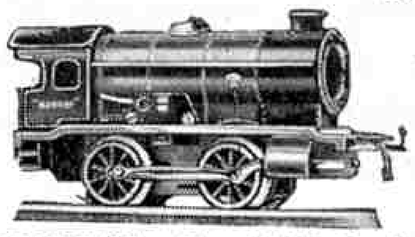
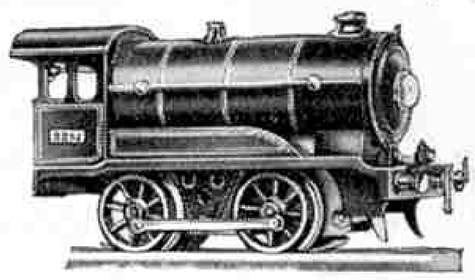
Gauge O **(Electric)** Gauge O

Hornby Electric Locomotives, both 6-volt and 20-volt, are fitted with powerful and efficient motors, capable of hauling heavy loads at high speeds. They are the finest electric locomotives obtainable. Ask your dealer for a complete price list.

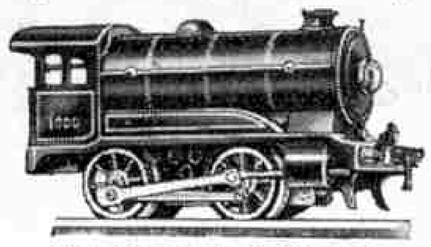


EM120 (20-volt) or EM16 (6-volt) LOCOMOTIVE
Non - Reversing. Available in either red or green. Price 8/6

EM320 (20-volt) or EM36 (6-volt) TANK LOCOMOTIVE
Reversing. Available in red, with L.M.S.R. lettering, or green with L.N.E.R., G.W.R. or S.R. lettering ... ... Price 16/6



***HORNBY E020 (20-volt) LOCOMOTIVE**
Reversing ... ... Price 22/–



***HORNBY E120 (20-volt) LOCOMOTIVE**
Reversing ... ... Price 24/–

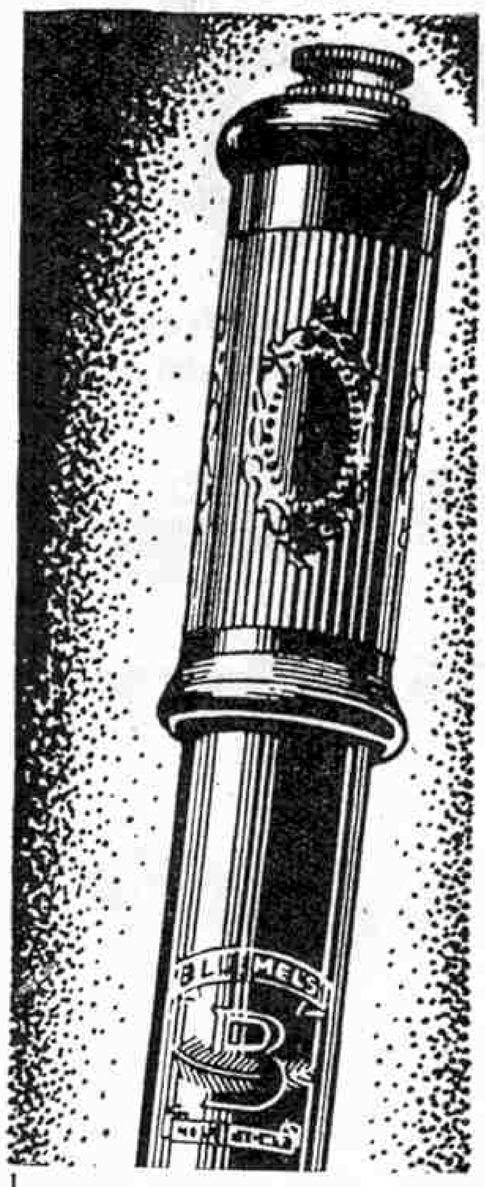
***HORNBY E120 SPECIAL LOCOMOTIVE (20-volt)**
Automatic Reversing. Price 30/–

***HORNBY E220 SPECIAL TANK LOCOMOTIVE (20-volt)**
Automatic Reversing. Price 32/6

***HORNBY E26 SPECIAL TANK LOCOMOTIVE (6-volt)**
Reversing ... ... Price 30/–

**Lettered and coloured to represent L.M.S.R., G.W.R., L.N.E.R. and S.R. Locomotives.*

Meccano Ltd., Binns Road, Liverpool 13



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● You cannot get a better pump than Bluemel's "Noweight," no matter how much you pay. Of superb quality, it will outlast many bicycles. Light in weight, easy to use, undentable! The 15 inch by $\frac{7}{8}$ inch "Noweight" costs only **2/6.** Other models from **1/6.**

● Send postcard for complete new list of "Noweight" accessories — mudguards, reflectors, lamps, horns, etc.

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THIS attractive Great Western Railway publication contains addresses of a large number of selected sites specially chosen for Camping, together with all necessary preliminary particulars relating to site, landowner or tenant, amount of land available, drinking water on site, etc.,

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Made of the finest materials

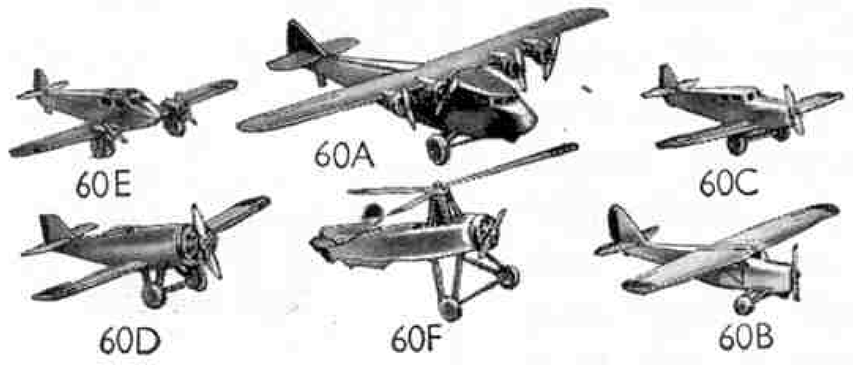
A fascinating collecting hobby

150 Varieties

Meccano Dinky Toys No. 24
MOTOR CARS
Fitted with rubber tyres and silver-plated radiators

No. 24a	Ambulance	each	9d.
No. 24b	Limousine...	,,	9d.
No. 24c	Town Sedan	,,	9d.
No. 24d	Vogue Saloon	,,	9d.
No. 24e	Super Streamline Saloon	,,	9d.
No. 24f	Sportsman's Coupé ...	,,	9d.
No. 24g	Sports Tourer (4 seater)	,,	9d.
No. 24h	Sports Tourer (2 seater)	,,	9d.

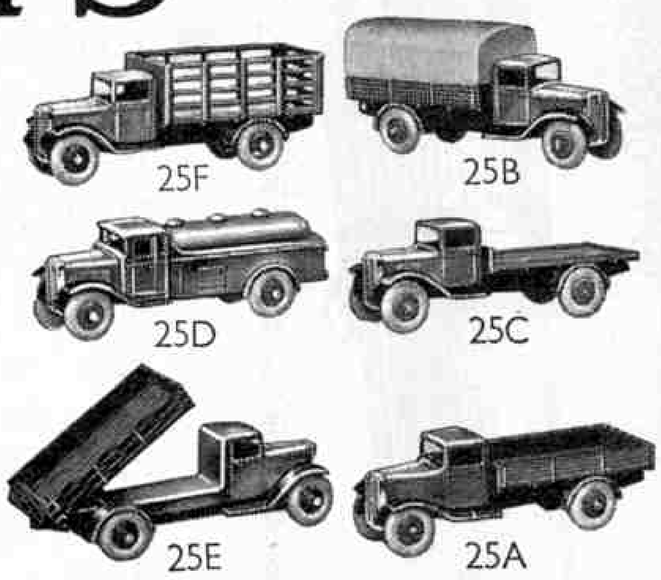
Price of complete set 6/-



Meccano Dinky Toys No. 60
AEROPLANES

No. 60a	Imperial Airways Liner ...	each	9d.
No. 60b	D.H. "Leopard Moth" ...	,,	6d.
No. 60c	Percival "Gull"	,,	6d.
No. 60d	Low Wing Monoplane ...	,,	6d.
No. 60e	General "Monospar" ...	,,	6d.
No. 60f	Cierva "Autogiro" ...	,,	6d.

Price of complete set 3/-

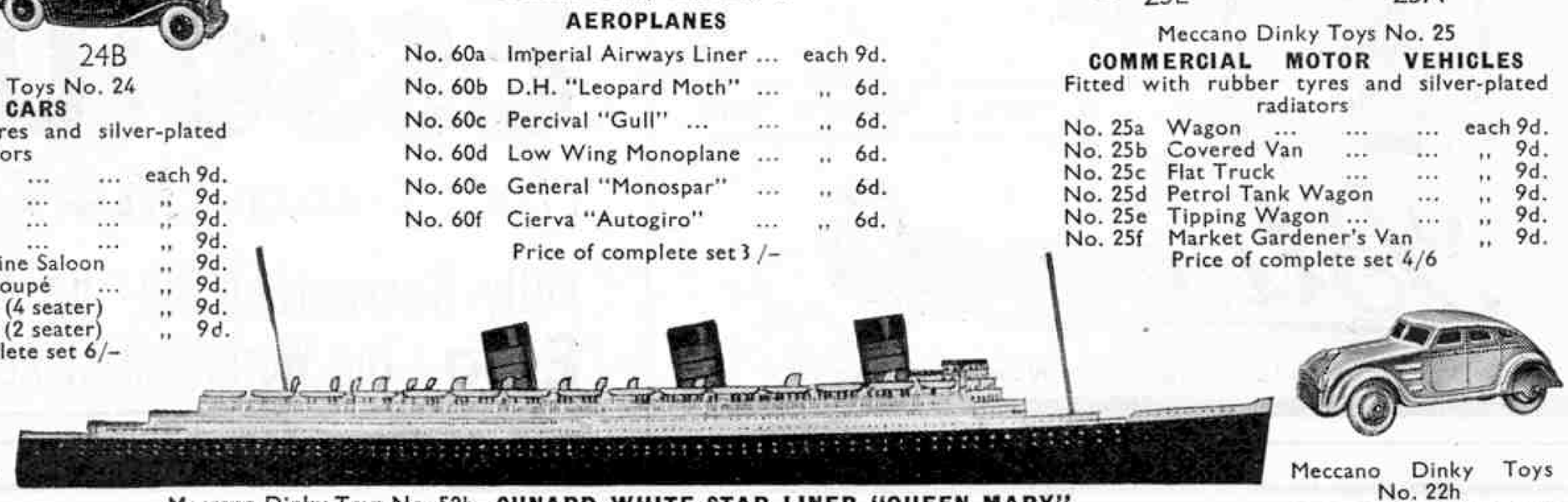


Meccano Dinky Toys No. 25
COMMERCIAL MOTOR VEHICLES
Fitted with rubber tyres and silver-plated radiators

No. 25a	Wagon	each	9d.
No. 25b	Covered Van	,,	9d.
No. 25c	Flat Truck	,,	9d.
No. 25d	Petrol Tank Wagon ...	,,	9d.
No. 25e	Tipping Wagon	,,	9d.
No. 25f	Market Gardener's Van	,,	9d.

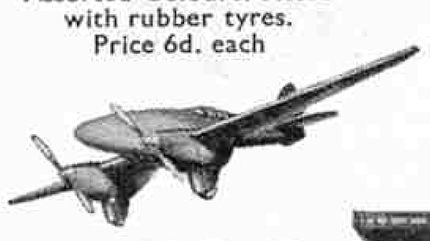
Price of complete set 4/6

Meccano Dinky Toys No. 22g
STREAMLINE TOURER
Assorted Colours. Fitted with rubber tyres.
Price 6d. each

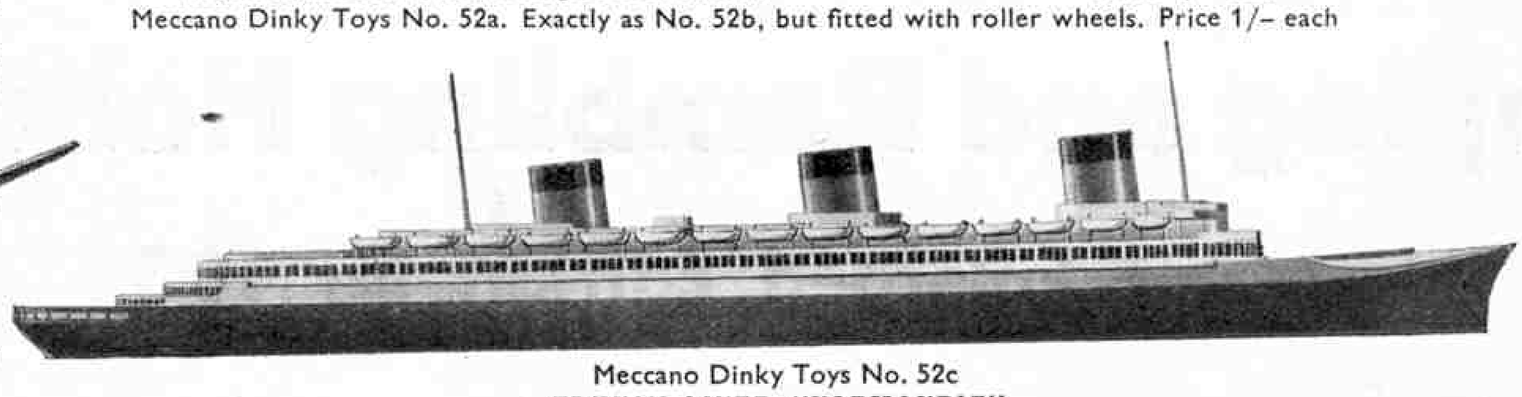


Meccano Dinky Toys No. 52b **CUNARD WHITE STAR LINER "QUEEN MARY"**
A scale model of Britain's largest ocean liner. Price 1/- each
Meccano Dinky Toys No. 52a. Exactly as No. 52b, but fitted with roller wheels. Price 1/- each

Meccano Dinky Toys No. 22h
STREAMLINE SALOON
Assorted Colours. Fitted with rubber tyres.
Price 6d. each

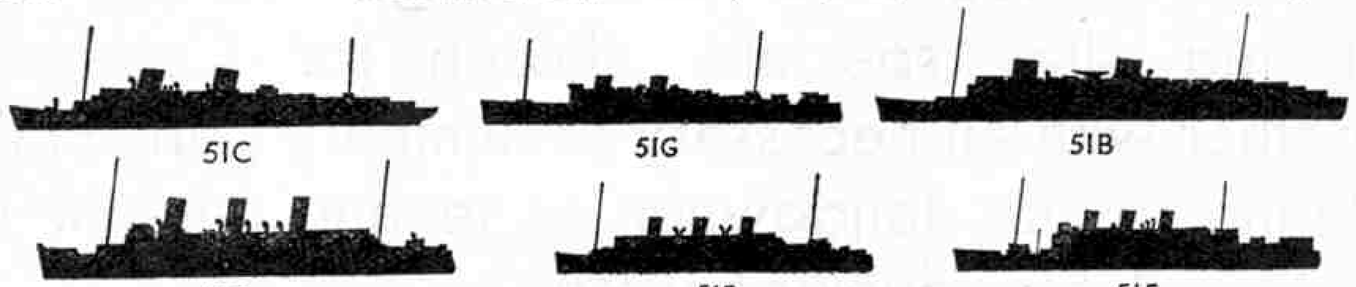


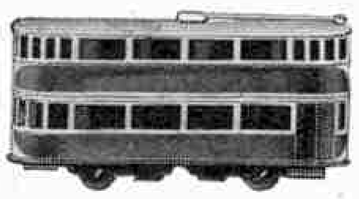
Meccano Dinky Toys No. 60g
D.H. "COMET" AEROPLANE
(Scale model of plane used by Captain Scott and Mr. Black in their Australian flight). Finished in assorted Colours.
Price 6d. each



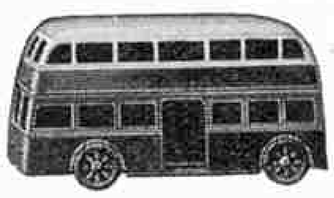
Meccano Dinky Toys No. 52c
FRENCH LINER "NORMANDIE"
A model of the French Line's new giant steamship "Normandie." This fine vessel was launched in October, 1932, from the Penhoët Shipyard, France, and is expected to take her place in the Havre-Plymouth-New York service of her owners at the end of this month. The model is to the same scale as the "Queen Mary" illustrated above. (Made in France by Meccano (France) Ltd.) Price 1/6 each

Meccano Dinky Toys No. 22c
MOTOR TRUCK
Assorted Colours. Fitted with rubber tyres.
Price 6d. each





Meccano Dinky Toys No. 27
TRAM CAR
Assorted Colours. Price 6d. each

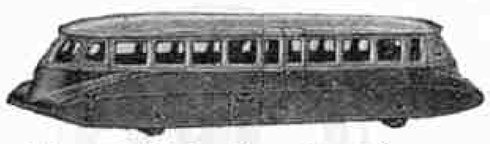


Meccano Dinky Toys No. 29
MOTOR BUS
Assorted Colours. Price 6d. each

Meccano Dinky Toys No. 51
FAMOUS LINERS

No. 51b	"Europa"	...	each 9d.	No. 51e	"Strathaird" ...	... each 6d.	
No. 51c	"Rex"	...	,, 9d.	No. 51f	"Queen of Bermuda"	... ,, 6d.	
No. 51d	"Empress of Britain"	...	,, 8d.	No. 51g	"Britannic" ...	... ,, 6d.	

Price of complete set 3/6

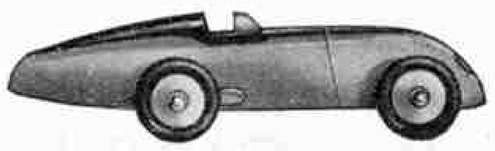


Meccano Dinky Toys No. 26
G.W.R. RAIL CAR
Assorted Colours. Price 6d. each

Meccano Dinky Toys No. 50
SHIPS OF THE BRITISH NAVY

No. 50a	Battle Cruiser "Hood" ...	each 9d.	No. 50e	Cruiser "Delhi" ...	... each 4d.		
No. 50b	Battleships, "Nelson" Class (2)	,, 6d.	No. 50f	Destroyers, "Broke" Class (3)	,, 1d.		
No. 50c	Cruiser "Effingham" ...	,, 4d.	No. 50g	Submarine, "K" Class ...	,, 1d.		
No. 50d	Cruiser "York"	,, 4d.	No. 50h	Destroyers, "Amazon" Class (3)	,, 1d.		

No. 50k Submarine, "X" Class ... each 1d.
Price of complete set 3/6



Meccano Dinky Toys No. 23a
RACING CAR
Assorted Colours. Fitted with rubber tyres. Price 6d. each

Manufactured by MECCANO LTD., Binns Road, LIVERPOOL 13

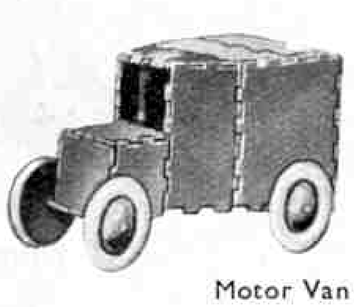
MECCANO DINKY BUILDER

A Fascinating Building Hobby for Girls and Boys

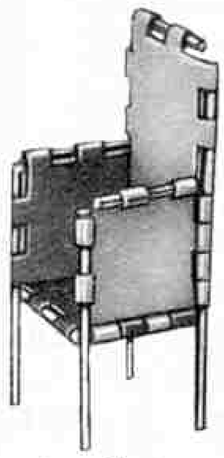
The Meccano Dinky Builder is already a great favourite with boys and girls. It is a most fascinating constructional toy, specially designed for the younger children for whom it provides hours of absorbing fun. The brightly coloured parts are fitted together in a most simple and ingenious manner without the use of any nuts and bolts, giving results that are attractive and of exceptional interest. Two Outfits are available: No. 1 for general construction, including wheel toys, and No. 2 for making groups of miniature furniture. Your dealer will be pleased to show you these new Meccano Dinky Builder Outfits.

Manufactured by Meccano Limited, Binns Road, Liverpool 13.

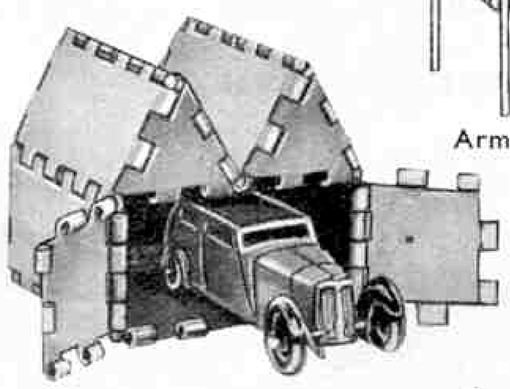
No. 1 Dinky Builder Outfit



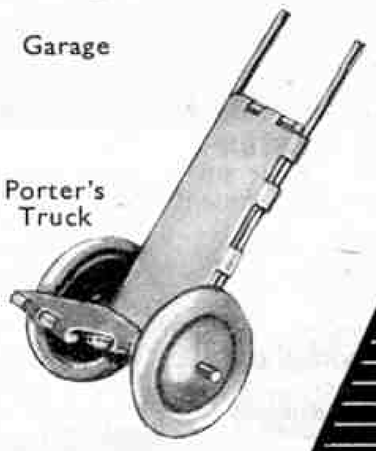
Motor Van



Arm Chair



Garage



Porter's Truck

No. 2 Dinky Builder Outfit

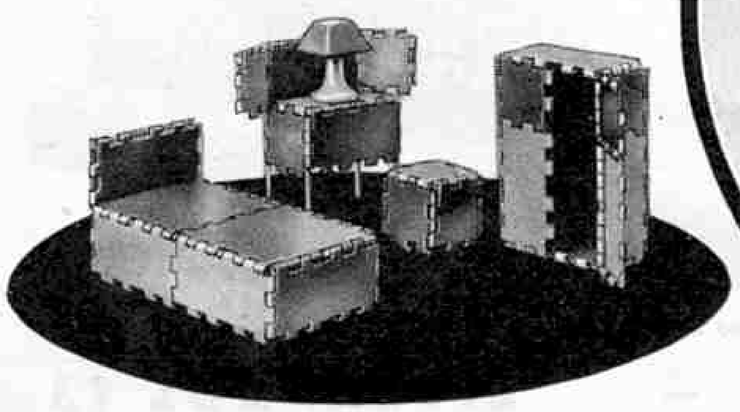
No. 1 DINKY BUILDER OUTFIT

This Outfit contains a good selection of parts with which a large number of models can be made. It includes two trees on die-cast stands that lend the correct atmosphere to models of farm buildings, churches, etc. A further attraction are the wheels, finished in blue with white tyres, for constructing miniature wheel toys. The beautifully coloured instruction leaflet included in the Outfit illustrates a total of 44 models that any boy or girl can build. Price **5/-**

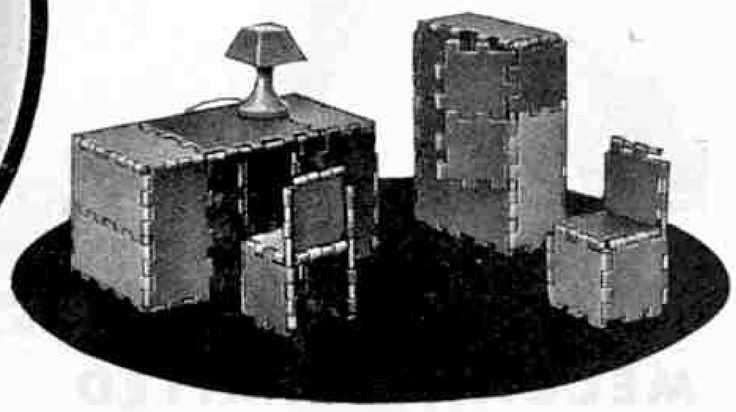
No. 2 DINKY BUILDER OUTFIT

The No. 2 Dinky Builder Outfit contains a wide selection of parts primarily intended for the construction of realistic groups of miniature modern furniture. The small table lamp and shade that are included add greatly to the realism of these groups, particularly as the lamp can be lighted from an ordinary flash lamp battery. The coloured instruction leaflet gives examples of 7 furniture groups, but to an enthusiastic model builder the possibilities of the Outfit are practically inexhaustible. Price **7/6**

Group of Bedroom Furniture made with No. 2 Outfit.



Group of Office Furniture made with No. 2 Outfit.

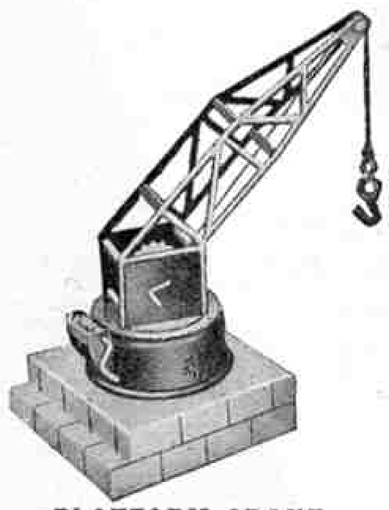


HORNBY SERIES

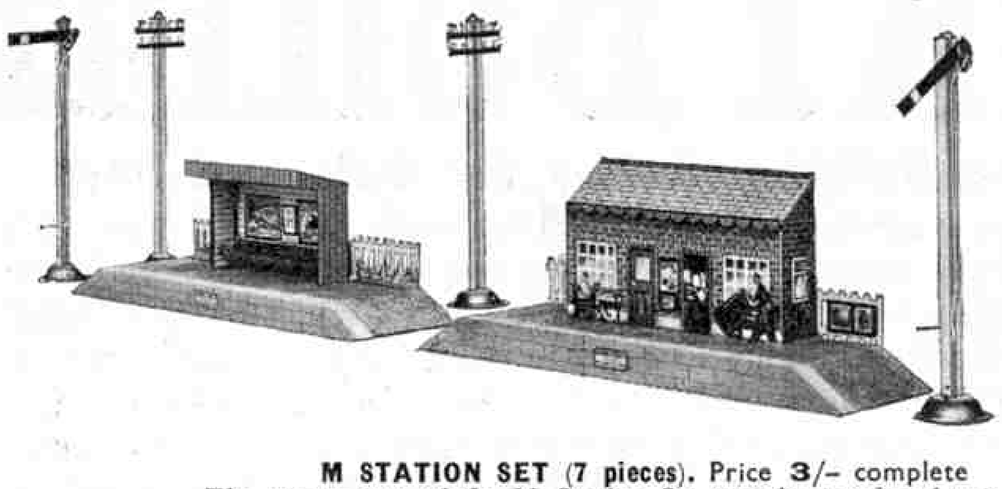
HORNBY ACCESSORIES

GAUGE 0

There is a splendid range of Railway Accessories in the Hornby Series, built in perfect proportion and beautifully finished. With these realistic accessories the most elaborate model railway may be constructed and operated in exactly the same manner as a real railway. A selection of Hornby Accessories is shown on this page. Ask your dealer to show you the full range.

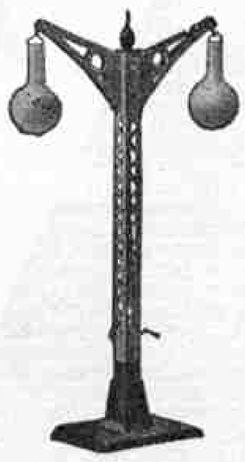


PLATFORM CRANE
Fitted with a crank handle and ratchet mechanism.
Price **3/11**



M STATION SET (7 pieces). Price **3/-** complete
The components of the M Station Set may be purchased separately.
M Signal Box. Price **4d.** M Signal. Price **4d.** M Station. Price **1/-.** M Telegraph Pole No. 1. Price **3d.** M Wayside Station. Price **9d.**

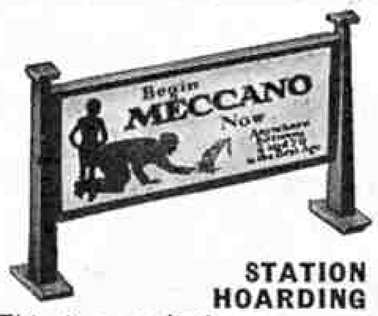
No. 1E LAMP STANDARD ELECTRICAL
(Single, as illustrated.)
Price **3/6**



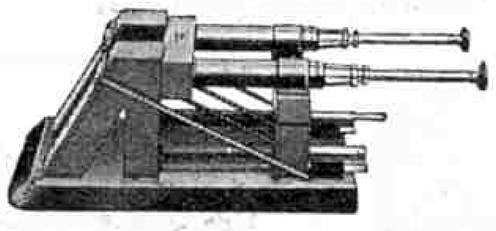
No. 1 LAMP STANDARD
(Single.)
Price **3/6**

No. 2E LAMP STANDARD ELECTRICAL
(Double.)
Price **4/3**

No. 2 LAMP STANDARD
(Double, as illustrated.)
Price **4/6**



STATION HOARDING
This is a realistic accessory, suitable for the station platform. Brightly coloured.
Price **6d.**

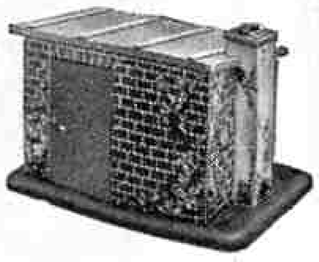


No. 2 BUFFER STOPS
(Hydraulic type.) Price **5/6**

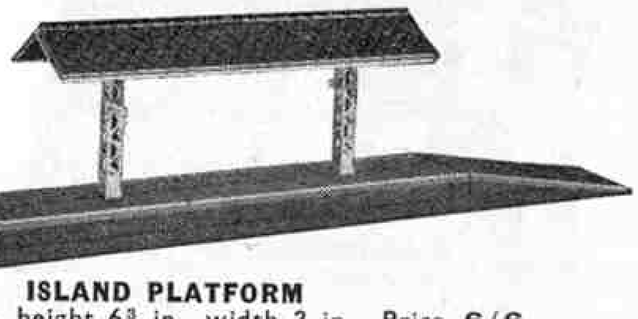
LOADING GAUGE
(Illustrated.)
Price **2/3**
M LOADING GAUGE
Price **1/-**

TUNNEL (Metal)
(As illustrated.)
Price **3/11**

POSTERS IN MINIATURE
These Posters are beautifully printed in full colours.
No. 1 Series. Packet of 51 Price **6d.**
No. 2 Series. Packet of 51 ,, **6d.**



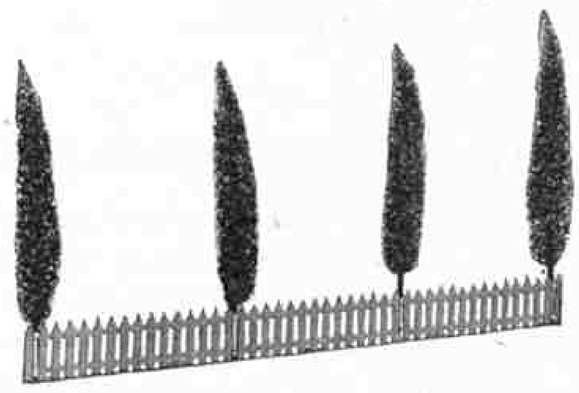
PLATELAYER'S HUT
Price **1/-**



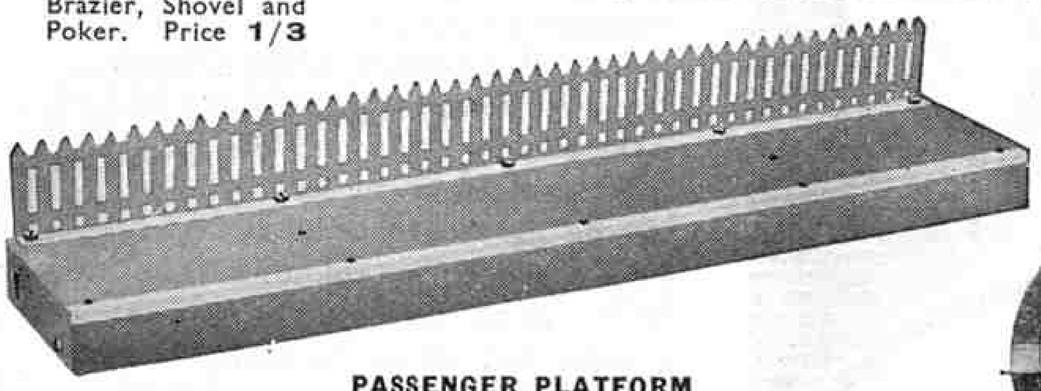
ISLAND PLATFORM
Length 32¼ in., height 6¾ in., width 3 in. Price **6/6**
The ramps may be purchased separately. Price, per pair, **1/9**

No. 7 RAILWAY ACCESSORIES
Watchman's Hut, Brazier, Shovel and Poker. Price **1/3**

No. 2 STATION
Excellent model, beautifully designed. Built up in three detachable sections.
Length 2 ft. 9 in, breadth 6 in., height 7 in. Price **9/6**



FENCING WITH FOUR TREES
Length 16½ in. The miniature trees are detachable. Price, per pair, **2/6**

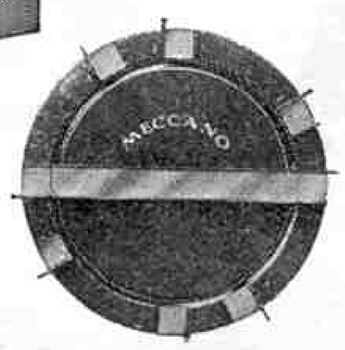


PASSENGER PLATFORM
Length 16½ in., width 3 in. This Platform may be connected to the main Station or used separately ... ... Price **2/6**
The white Paled Fencing may be purchased separately. Price per length **6d.**

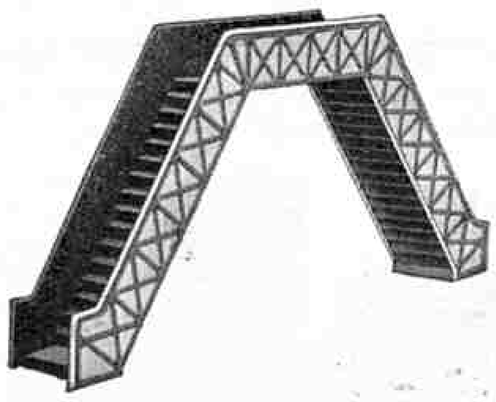
LUBRICATING OIL
Specially prepared for Hornby Trains, Rolling Stock and Accessories.
Price, per bottle, **6d.**

GRAPHITE GREASE
An ideal lubricant for the springs of Hornby Locomotives and Hornby Speed Boats, Meccano and Aero Clockwork Motors, and Meccano Motor Cars.
Price, per tube, **6d.**

TREES
Trees with Stands, assorted per doz. **3/-**
Trees, Oak ... ,, **2/6**
Trees, Poplar ... ,, **2/-**
Stands for Trees ,, **1/-**
Hedging on Base (10½ in. lengths) ,, **3/-**

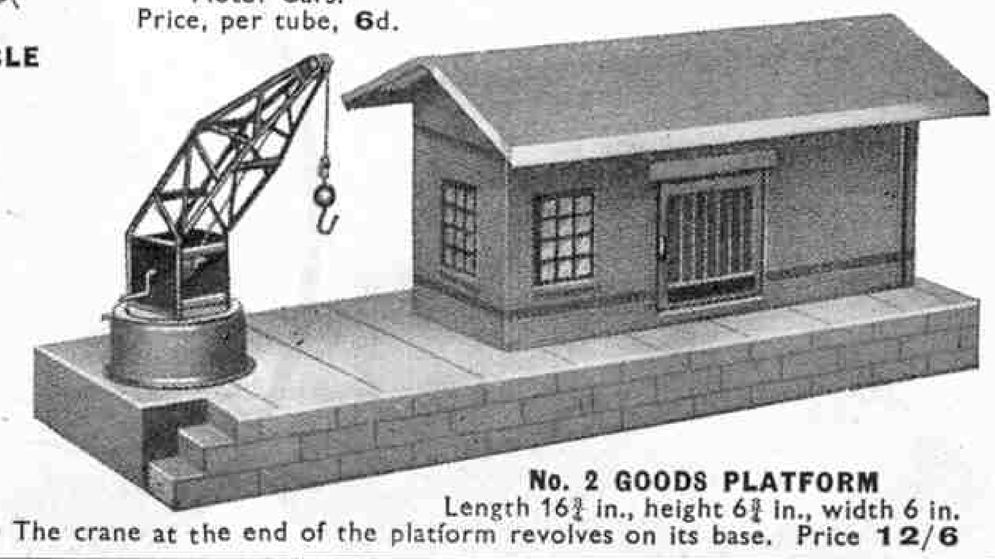


No. 2 TURNTABLE
Price **3/9**



M SERIES FOOTBRIDGE
This strongly-built Footbridge is made to span a single track. Price **1/3**

No. 1 GOODS PLATFORM
Length 13 in., height 6¾ in., width 6 in. Price **7/6**



No. 2 GOODS PLATFORM
Length 16¾ in., height 6¾ in., width 6 in.
The crane at the end of the platform revolves on its base. Price **12/6**

MECCANO LIMITED — BINNS ROAD — LIVERPOOL 13

HORNBY SERIES

HORNBY ROLLING STOCK

GAUGE O

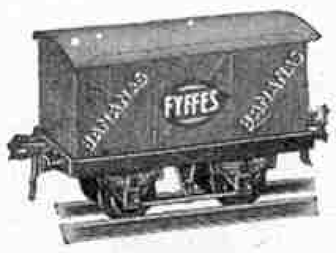
Now is the time to add to your Hornby Railway. Every boy knows that a real railway system is constantly expanding and developing. New rolling stock and new equipment are added; new tracks are laid; new stations, signal cabins and goods sheds are built; new tunnels and viaducts are constructed—every effort is made to cater for modern requirements. Your Hornby railway, too, can be run in the same progressive manner. One by one you can add Coaches, Trucks, Wagons and Vans of the latest types; and Stations, Signals, Bridges, Turntables and Engine Sheds that will gradually convert your present Hornby railway into a really fine model railway system.

Ask your dealer to show you the full range of Hornby Rolling Stock and Accessories.

OIL TANK WAGON "MOBILOIL"
Finished in battleship grey. Price **2/-**

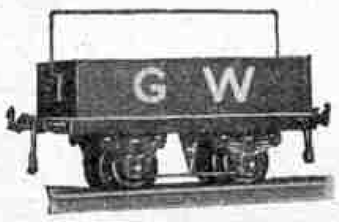
PETROL TANK WAGON "B.P."
Finished in yellow. Price **2/-**

BRAKE VAN (French Type)
Lettered "Nord." Beautifully finished in colours. Opening doors. Price **4/-**



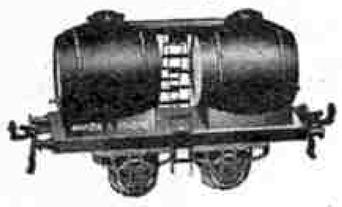
BANANA VAN
An attractive model, finished in yellow and green. Price **2/9**

No.1 MILK TRAFFIC VAN
Fitted with sliding doors. Complete with milk cans. Price **2/11**



***OPEN WAGON "B"**
Similar to Hornby Wagon No. 1 but fitted with centre tarpaulin supporting rail. Price **2/-**

SIDE TIPPING WAGON
Excellent design and finish. Lettered "Robert Hudson Ltd." Price **2/-**

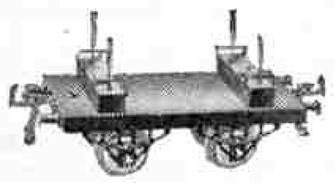


WINE WAGON DOUBLE BARREL
An attractive model artistically enamelled in red and green. Price **4/6**

TIMBER WAGON No. 1
Beautifully enamelled in yellow and red. Price **1/6**

SNOW PLOUGH
With revolving plough driven from front axle. Price **3/9**

***GUNPOWDER VAN**
Finished in red. With opening doors. Price **2/9**



LUMBER WAGON No. 1
Fitted with bolsters and stanchions for log transport. Price **1/3**

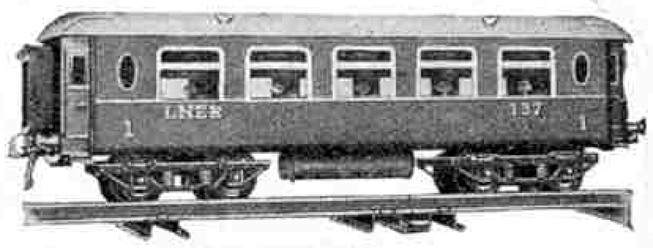
BITUMEN TANK WAGON "COLAS"
Finished in blue. Price **3/6**

No. 0 MITROPA COACH
finished in red with white roof. Lettered "Mitropa," with either 'Spiesewagen" or "Schlafwagen" in gold. Price **1/6**

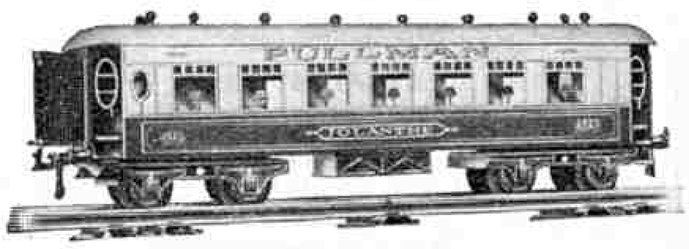
No. 0 MILK TRAFFIC VAN
An attractive model. Available lettered G.W. only. Price **1/11**

COAL WAGON
This is similar to Hornby Wagon No. 1. It is fitted with embossed representation of coal. Price **2/3**

No. 3 MITROPA COACH
Lettered "Mitropa," with either "Spiesewagen" or "Schlafwagen" in gold. Beautifully finished in red enamel with white roof. Price **12/6**



No. 2 SALOON COACH
Realistic in design and beautifully finished. Two types are available: L.M.S. (as illustrated) enamelled maroon, and L.N.E.R. enamelled brown. Suitable for 2-ft. radius rails only. Price **9/6**



HORNBY No. 2 SPECIAL PULLMAN COACH
As supplied with No. 2 Special and No. 3 Pullman Train Sets. This splendid coach is perfect in detail and finish. Suitable for 2-ft. radius rails only. Price **13/-**

TROLLEY WAGON
Finished in brown and blue. Suitable for 2-ft. radius rails only. Price **3/11**

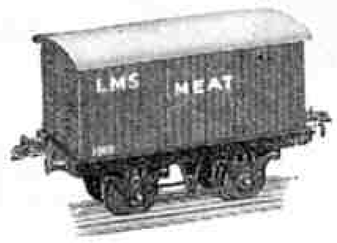
No. 2 TIMBER WAGON
Beautifully enamelled in green and red. Suitable for 2-ft. radius rails only. Price **2/6**

No. 2 LUMBER WAGON
Fitted with bolsters and stanchions for log transport. Suitable for 2-ft. radius rails only. Price **2/11**

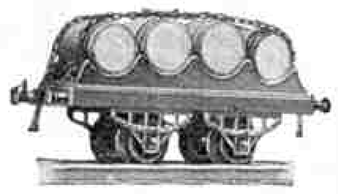
In L.M.S., L.N.E.R., G.W. or S.R. lettering.

PETROL TANK WAGON "SHELL"
Finished in red. Price **2/-**

OIL TANK WAGON "CASTROL"
An attractive model. Enamelled green with lettering in red. Price **2/-**

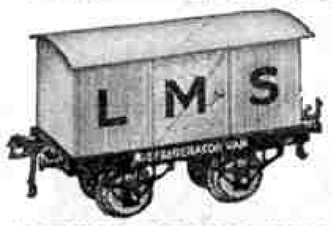


MEAT VAN
This is a very realistic model. Available lettered L.M.S. only. Price **1/11**

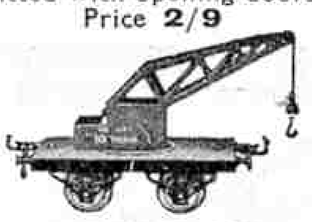


BARREL WAGON
This is another interesting model of a type of wagon used in France and other European countries. Price **2/6**

COVERED WAGON (French Type)
This wagon is fitted with frame and sheet. French type lettered "Nord." Price **2/6**



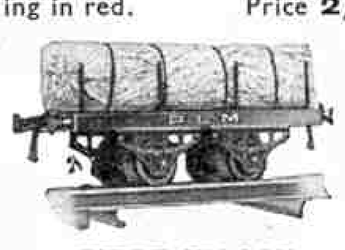
***REFRIGERATOR VAN**
Beautifully enamelled. Fitted with opening doors. Price **2/9**



CRANE TRUCK
Finished in brown and blue. Price **2/11**

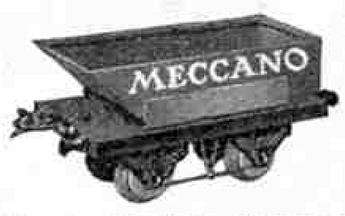
***No. 1 CATTLE TRUCK**
Fitted with sliding doors. Very realistic design. Price **2/9**

FISH VAN
This is a distinctive model. Available lettered N.E. only. Price **1/11**

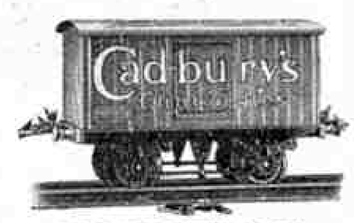


FIBRE WAGON
This is an interesting model of a type of wagon used in France and other European countries. Price **1/3**

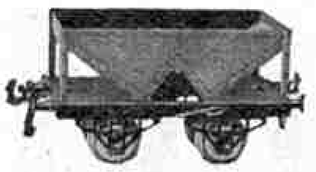
GAS CYLINDER WAGON
Finished in red, lettered gold. Price **1/11**



No. 1 ROTARY TIPPING WAGON
Finished in orange. Price **2/6**



CHOCOLATE VAN "CADBURY'S"
This new van is beautifully enamelled in blue with orange roof. Price **2/9**



***HOPPER WAGON**
Mechanically unloaded. Finished in green. Price **3/6**

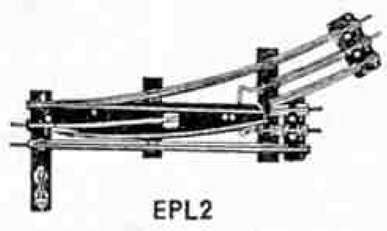
MILK TANK WAGON "UNITED DAIRIES"
A very realistic model, finished in blue and white. Price **4/6**

CEMENT WAGON
The door at the top opens. Finished in bright red. Price **2/6**

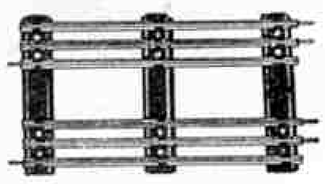
Manufactured by **MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13**

HORNBY RAILS, POINTS AND CROSSINGS

ECA


EPL2

EA2½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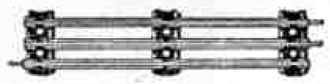
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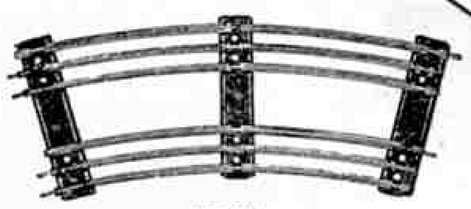
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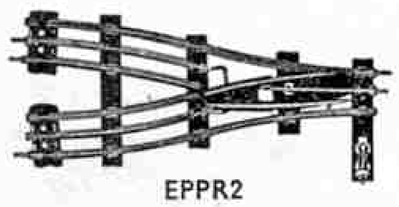
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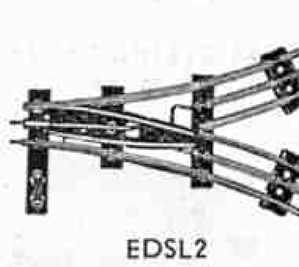
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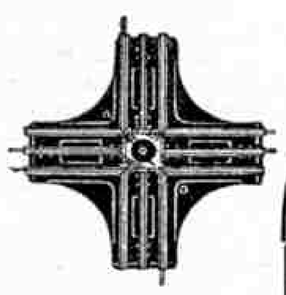
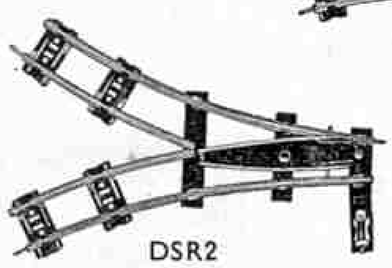

ECR

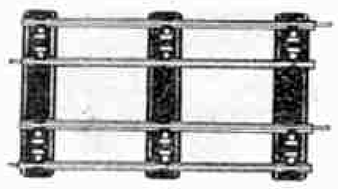
EA2


DSR2

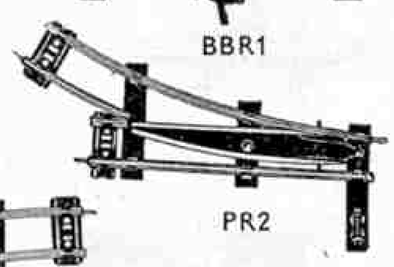
B½

A2

CA2


DS1

BBR1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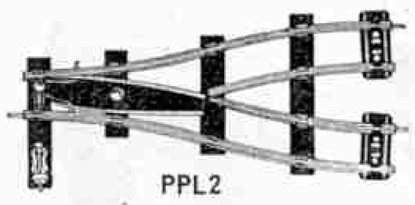
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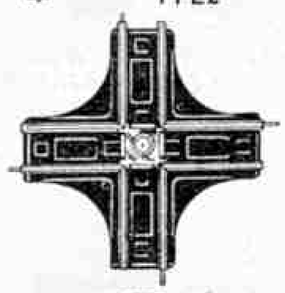
A2½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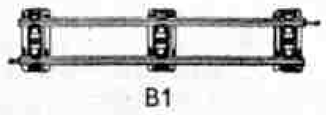
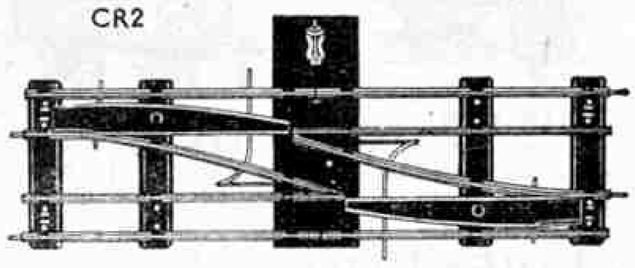
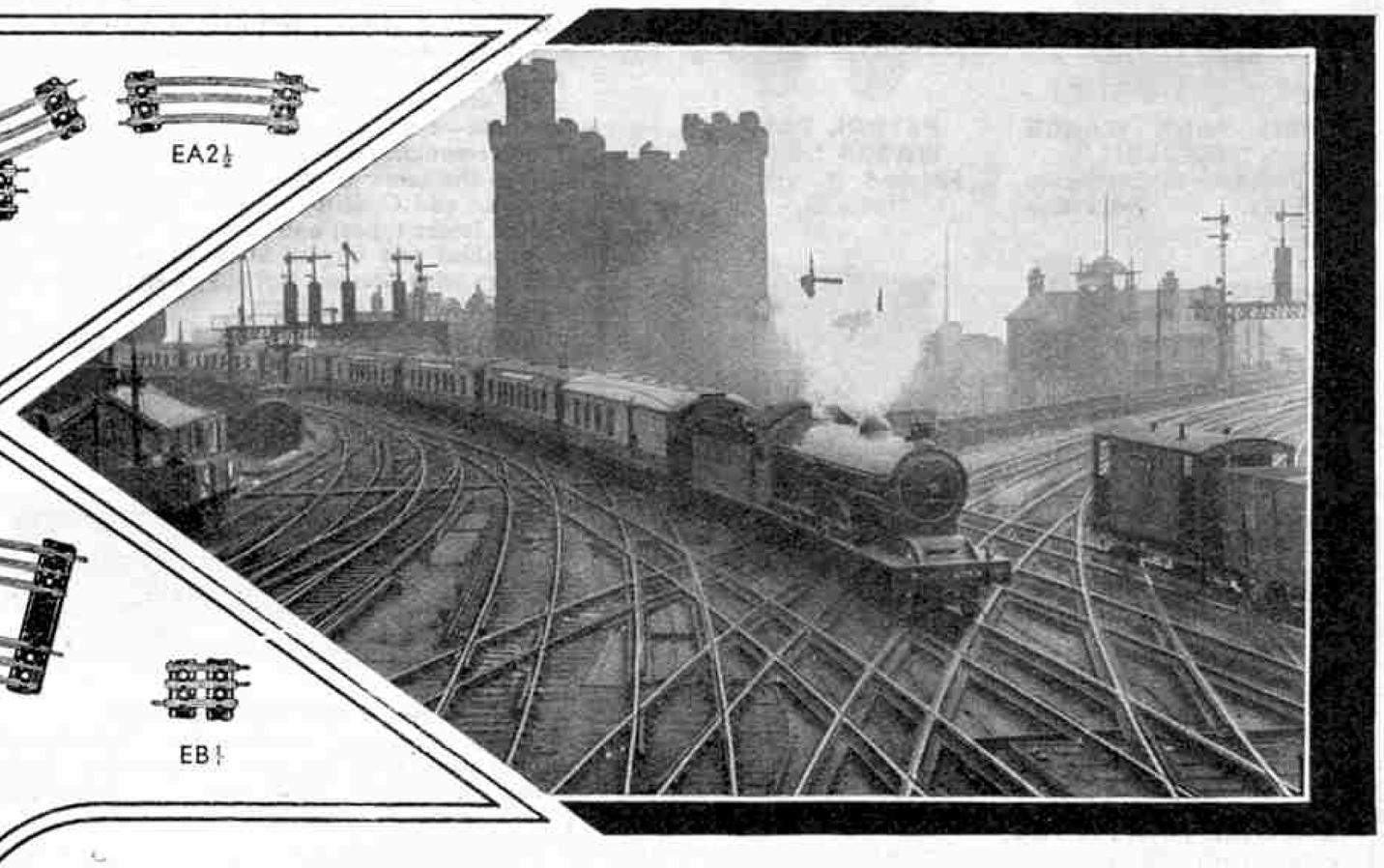

B1


COR2



There is practically no limit to the number of rail formations that can be built with Hornby Rails, Points and Crossings. A supply of Rails is included in every Hornby Train Set, but the owner is certainly not getting the best out of his set if he is satisfied with merely running it round a simple oval track. The addition of extra Rails and of Points and Crossings to his equipment lends a delightful realism to the game and greatly enhances the fun.

Rails for Electric Trains, Gauge 0, 1¼"

CURVED RAILS

1-ft. Radius

EA1	Curved rails	per doz.	5/–
EA1½	Curved half rails	,,	4/6
EA1¼	Curved quarter rails	,,	4/–

2-ft. Radius

EA2	Curved rails	per doz.	5/–
EA2½	Curved half rails	,,	4/6
EA2¼	Curved quarter rails	,,	4/–
EDC2	Curved rails, double track ...	½ doz.	9/–

STRAIGHT RAILS

EB1	Straight rails	per doz.	5/–
EB½	Straight half rails	,,	4/6
EB¼	Straight quarter rails	,,	4/–
EDS1	Straight rails, double track ...	½ doz.	8/6

POINTS

For 1-ft. Radius Curves

EPR1	Right-hand points }	per pair	5/9
EPL1	Left-hand points }		

For 2-ft. Radius Curves

EPR2	Right-hand points }	per pair	6/6
EPL2	Left-hand points }		

CROSSINGS

ECA	Acute-angle crossings	each	2/9
ECR	Right-angle crossings	,,	2/9

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

EDSR1	Double symmetrical points, right-hand,		
EDSL1	Double symmetrical points, left-hand,	per pair	6/–

For 2-ft. Radius Curves

EDSR2	Double symmetrical points, right-hand,		
EDSL2	Double symmetrical points, left-hand,	per pair	7/–

PARALLEL POINTS

EPPR2	Parallel points, right-hand }	per pair	7/–
EPPL2	Parallel points, left-hand }		

CROSSOVER POINTS

ECOR2	Crossover points, right-hand }	per pair	24/–
ECOL2	Crossover points, left-hand }		
EMC20	Switch rail (20-volt)	each	1/3
EMC6	Switch rail (6-volt)	,,	1/3
TCP20	Terminal connecting plates (20-volt)	,,	1/3
TCP6	Terminal connecting plates (6-volt)	,,	1/3

Rails for Clockwork and Steam Trains, Gauge 0, 1¼"

CURVED RAILS

9-in. Radius (for MO Trains)

M9	Curved rails	per doz.	2/6
MB9	Curved brake rails	each	3d.
A1	Curved rails (1-ft. Radius) ...	per doz.	3/6
A1½	Curved half rails ... ,, ...	,,	3/–
A1¼	Curved quarter rails ,, ...	,,	2/6
AB1	Curved brake rails ,, ...	each	4d.
A2	Curved rails (2-ft. Radius) ...	per doz.	3/6
A2½	Curved half rails ,, ...	,,	3/–
A2¼	Curved quarter rails ,, ...	,,	2/6
AB2	Curved brake rails ,, ...	each	5d.
DC2	Curved rails, double track ,, ...	½ doz.	6/–

STRAIGHT RAILS

BM	Straight rails (for MO Trains) ...	per doz.	2/6
B1	Straight rails	,,	3/6
B½	Straight half rails	,,	3/–
B¼	Straight quarter rails	,,	2/6
BB1	Straight brake rails	each	4d.
BBR1	Straight brake and reverse rails...	,,	1/6
DS1	Straight rails, double track ...	½ doz.	5/3

CROSSINGS

CA1	Acute-angle crossings (for 1-ft. radius tracks)	each	1/9
CA2	Acute-angle crossings (for 2-ft. radius tracks)	,,	1/6
CR1	Right-angle crossings (for 1-ft. radius tracks)	,,	1/9
CR2	Right-angle crossings (for 2-ft. radius tracks)	,,	1/6

POINTS

9-in. Radius (for MO Trains)

MR9	Right-hand points ... ... }	per pair	3/–
ML9	Left-hand points ... ... }		

For 1-ft. Radius Curves

PR1	Right-hand points ... ... }	per pair	3/–
PL1	Left-hand points ... ... }		

For 2-ft. Radius Curves

PR2	Right-hand points ... ... }	per pair	3/–
PL2	Left-hand points ... ... }		
PSR2	Points on solid base, right-hand }	per pair	8/6
PSL2	Points on solid base, left-hand }		

PARALLEL POINTS

PPR2	Parallel points, right-hand }	per pair	3/6
PPL2	Parallel points, left-hand }		

DOUBLE SYMMETRICAL POINTS

For 1-ft. Radius Curves

DSR1	Double symmetrical points, right-hand,		
DSL1	Double symmetrical points, left-hand,	per pair	3/6

For 2-ft. Radius Curves

DSR2	Double symmetrical points, right-hand,		
DSL2	Double symmetrical points, left-hand,	per pair	3/6

CROSSOVER POINTS

COR2	Crossover points, right-hand }	per pair	12/–
COL2	Crossover points, left-hand }		
RCP	Rail connecting plates ...	½ doz.	2d.

Many interesting illustrations and much useful information regarding Hornby Railway layouts are given in the booklets entitled "How to plan your Hornby Railway," and "Hornby Layouts—One Hundred Suggestions." Each of these booklets is obtainable from your dealer, price 3d., or from Meccano Ltd., Binns Road, Liverpool 13, price 4d. post free.

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First of all, study carefully the latest Hornby Train Catalogue, and select from it the new up-to-date Hornby Locomotive you want. Then pack up your old Hornby Locomotive and send it to us addressed "Special Service Department," Meccano Ltd., Binns Rd., Liverpool 13. Your order for the new Locomotive and the necessary remittance should be enclosed. You can easily ascertain how much to send by deducting the part exchange allowance indicated in the list given below from the price of the new Locomotive, and adding 1/– for postage on the new model you purchase. It is important to note that the catalogue price of the new Hornby Locomotive you purchase **must not be less than double the Part Exchange allowance made for your old Locomotive.**

If you prefer to do so, you can effect the exchange through your dealer, who will be very pleased to give you any information you require.

PART EXCHANGE ALLOWANCES FOR HORNBY LOCOMOTIVES

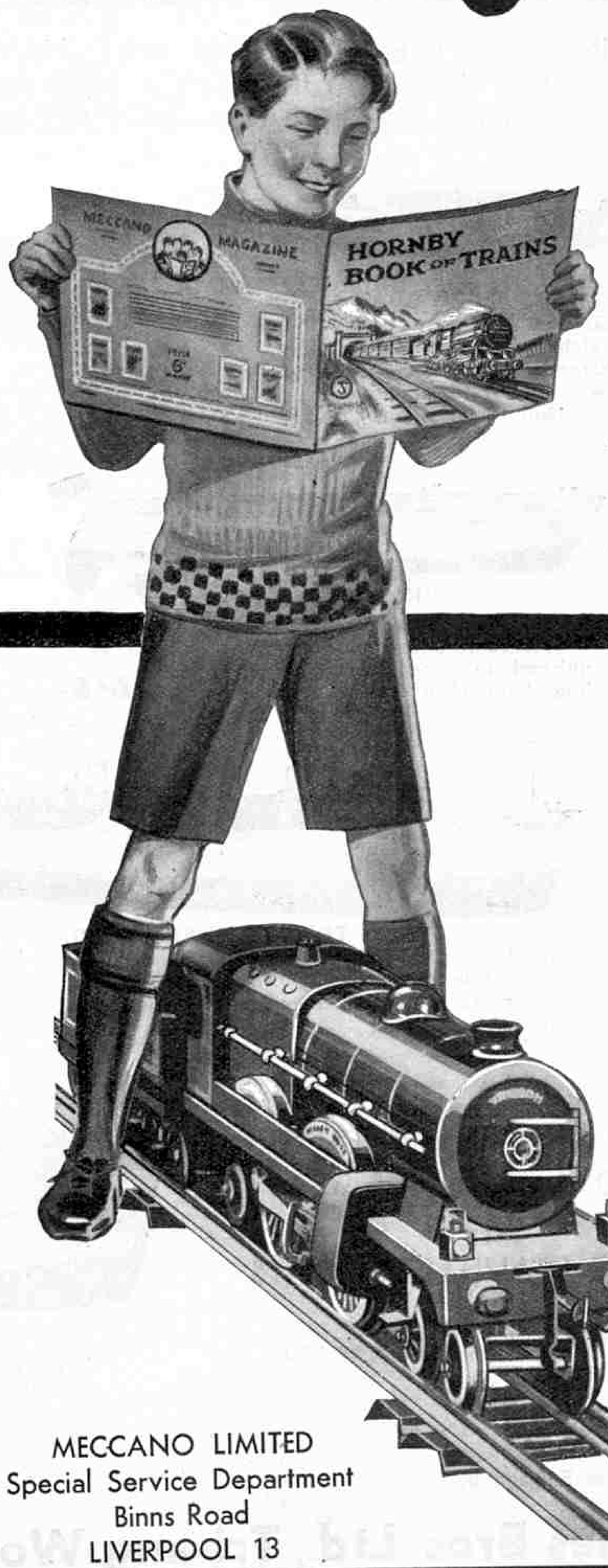
CLOCKWORK MODELS

M2930 Locomotive	1/–
MO Locomotive	1/4
M1/2 Locomotive	2/3
*George V Locomotive... ...	3/3
*No. OO Locomotive	3/3
M3 Tank Locomotive	3/9
M3 Locomotive	4/3
Zulu Locomotive	5/3
No. O Locomotive	5/3
Zulu Tank Locomotive... ...	6/3
No. 1 Tank Locomotive ...	6/3
No. 1 Locomotive	6/3
LEC 1 Locomotive (Swiss Type)	6/3
No. 1 Locomotive, fitted for Hornby Control	7/6
No. 1 Tank Locomotive, fitted for Hornby Control	7/6
No. 1 Special Locomotive ...	8/3
No. 1 Special Tank Locomotive	8/3
No. 2 Locomotive	10/–
No. 2 Tank Locomotive ...	10/6
No. 2 Special Tank Locomotive	10/6
Metropolitan C Locomotive ...	10/6
No. 2 Special Locomotive ...	11/3
No. 2 Locomotive, fitted for Hornby Control	11/3
No. 2 Tank Locomotive, fitted for Hornby Control	11/9
No. 3C Locomotive	12/–
No. 3C Riviera "Blue" Locomotive...	12/–

**These models were identical.*

ELECTRIC MODELS

EM16 or EM120 Locomotive ...	4/3
No. 1 Electric Tank Locomotive, Permanent Magnet	7/6
EM36 or EM320 Tank Locomotive	8/3
LST M3/20 Tank Loco (20 volt)	8/3
E06 or E020 Locomotive ...	11/–
E16 or E120 Locomotive ...	12/–
E16 or E120 Tank Locomotive...	12/–
LST 1/20 Tank Locomotive (20-volt)	12/–
LE 1/20 Loco (Swiss Type), 20-volt	12/6
LST 2/20 Tank Locomotive ...	12/6
E3/20 Locomotive	12/6
E3/20 Riviera Locomotive ...	12/6
LE 120 Locomotive	12/6
EPM16 Special Tank Locomotive	13/9
Metropolitan L.V. Locomotive	15/–
E26 Special Tank Locomotive ...	15/–
E36 Metropolitan Locomotive...	15/–
E120 Special Locomotive (automatic reverse)	15/–
No. 2 Electric Tank Locomotive	15/–
E120 Special Tank Locomotive (automatic reverse)	15/–
E36 Locomotive...	16/3
E36 Riviera "Blue" Locomotive	16/3
E220 Special Tank Locomotive (automatic reverse)	16/3
LE2/20 Locomotive	16/6
LE220 Locomotive (automatic reverse)	16/6
E320 Locomotive (automatic reverse)	17/6
E320 Riviera Locomotive (automatic reverse)	17/6
E220 Special Locomotive (automatic reverse)	18/9
Metropolitan H.V. Locomotive	20/–



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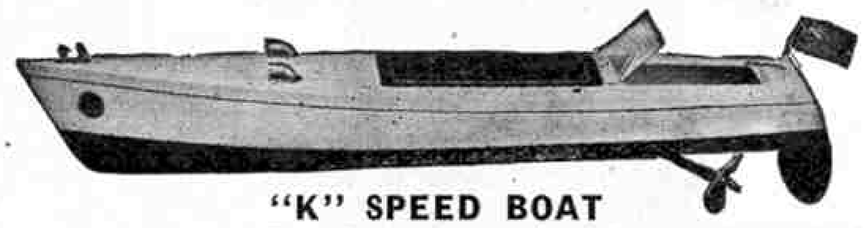
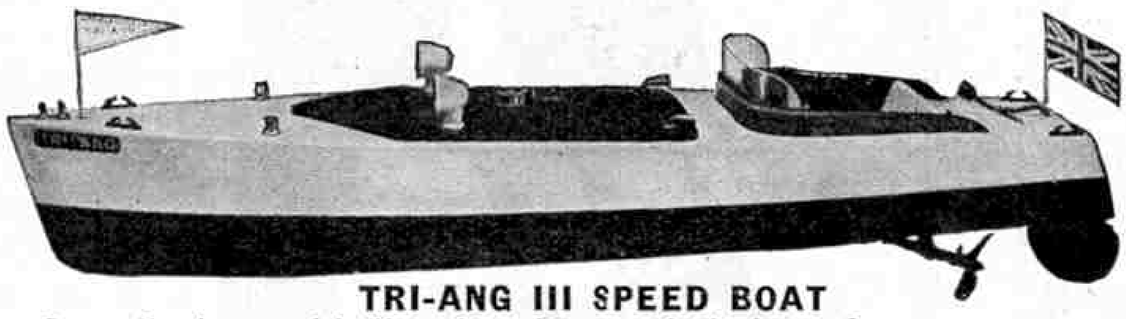
OO Size. Strong clockwork motor in watertight compartment with dummy ventilators and imitation deck, windscreen and adjustable rudder. Hull 11 in. overall **2'6**



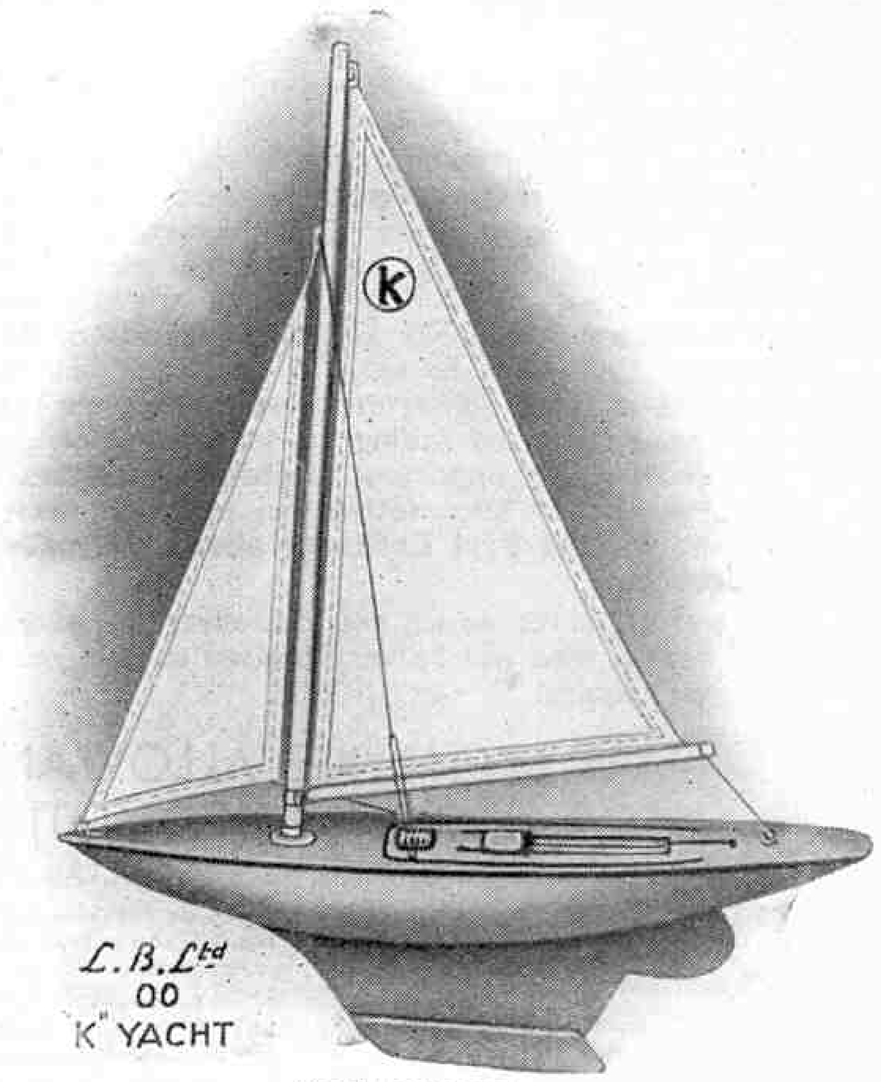
"K" SPEED BOAT

No. 1 Size. Fitted with powerful mechanism, windscreen, dummy ventilators and bollards. Hull finished in blue and white with red line. Hull 16 in. overall. **6'6**



TRI-ANG III SPEED BOAT

Specially designed hull with mahogany deck, brass fittings, ventilators, detachable motor cover. Very powerful long distance mechanism. Complete with bow pennant and stern flag. Length of hull 20 in. overall. **19'6**



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CABIN CRUISER

Fitted with illuminated cabin, port and starboard lights, separate switches for motor and lights, detachable mahogany superstructure with front and side screens.

DIDO.	Length of hull 20 in.	Price	**29'6**
JUNO.	,, ,,	23 in. ,,	**35'-**
VENUS.	,, ,,	28 in. ,,	**45'-**

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NEXT MONTH: "THE PASSING OF THE MAURETANIA." PUBLISHING DATE: 1st JUNE

MECCANO MAGAZINE

Editorial Office:
Binns Road, Liverpool 13
England

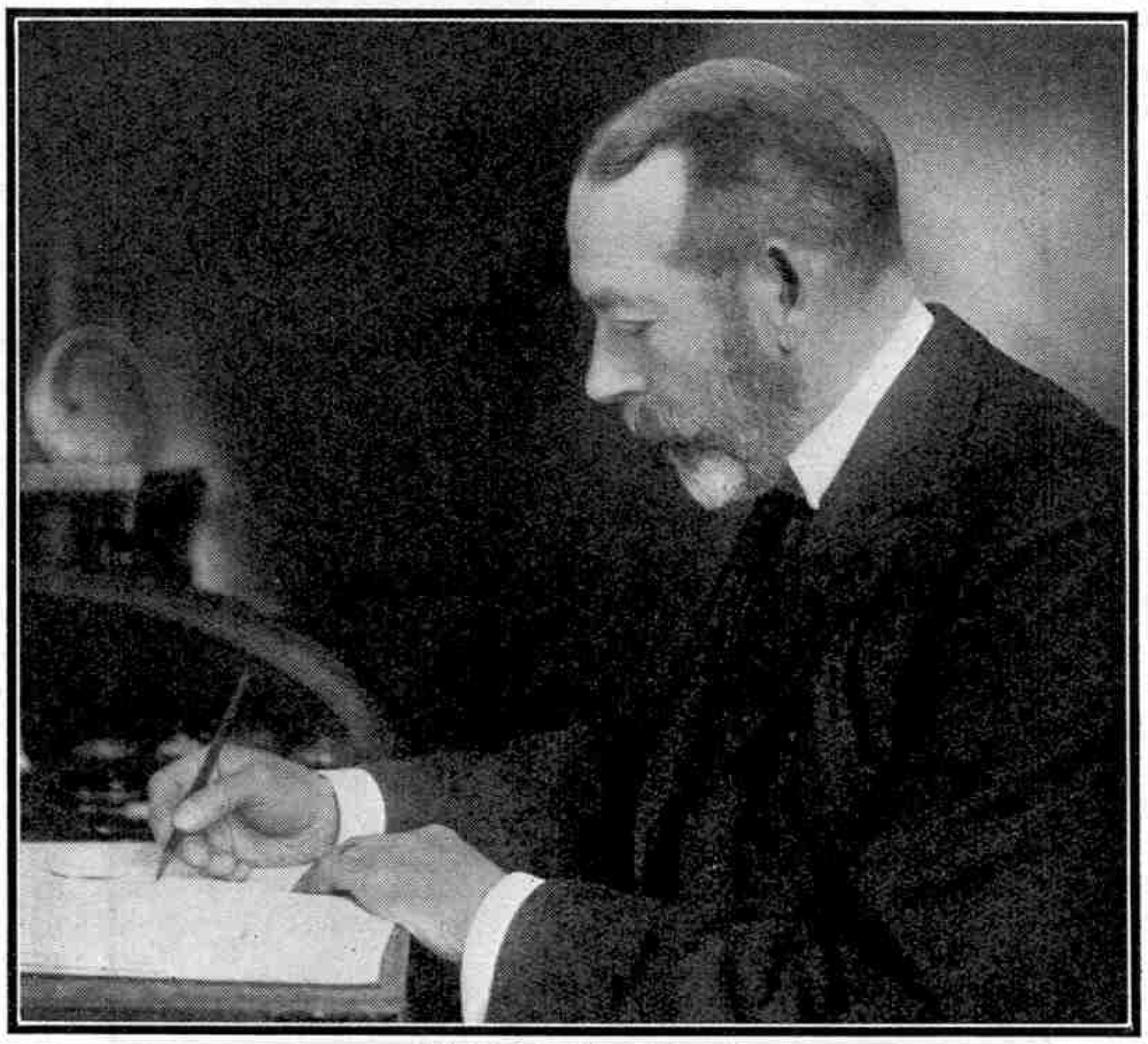
Volume XX. No. 5
May, 1935

With the Editor

God Save The King!

This month the thoughts of all my readers will be concentrated on the Silver Jubilee of His Majesty King George V, who has now reigned over us for 25 years. From his earliest days His Majesty has been closely identified with every aspect of British life. He has a wide personal knowledge of every part of the British Empire, and has proved himself a wise and efficient constitutional ruler, bearing his full share of the burdens that have fallen on the British people during his reign, notably in the critical days of the Great War. He is revered and looked up to throughout the Empire as the father of his people. This has been made abundantly evident on the occasions when he has spoken over the microphone to millions of his subjects, who in the crowded cities and in the most lonely parts of the Empire have listened with eagerness to his words.

His Majesty made a typically British start in life by joining the Navy, the senior public service. He became a naval cadet in 1877, along with his elder brother the Duke of Clarence, and made such a close study of naval affairs that he rose to the command of a gunboat. The unfortunate death of the Duke of Clarence compelled him to abandon his intention to follow the naval career for which he was intended, for it constituted him heir to the throne. Subsequently, first as Duke of York and then as Prince of Wales, he came into close touch with public affairs. He visited Australia, New Zealand and Canada in the course of a long tour that aroused great enthusiasm.



His Majesty King George V. [*Hoppé*

His Majesty's Coronation

He was called to the throne on 6th May 1910, on the death of his father King Edward VII, and his coronation took place on 22nd June of the following year. Shortly afterwards he created an important precedent by visiting his Indian Empire, being the first British Sovereign to do so. His tour through that great country was a wonderful triumph, and in a great durbar held at Delhi he announced that that city was again to become the Capital of India.

His Majesty had only reigned three years when there came the outbreak of the Great War, which was to overshadow all other events during the time that he has occupied the throne and to change the course of history. During the four years of that tremendous conflict every inhabitant of the country was called upon to do his share in the effort to save the British Empire from destruction. The King took a prominent part in shouldering the burdens, and shared not only in the work, but also in the triumph that the great national effort brought with it. The day had gone by when a British King actually could lead an army in battle, for his duties as a national leader and constitutional ruler lay in other fields; but he crossed to France several times, and actually joined his army in the field, being the first British King since 1743 to do this.

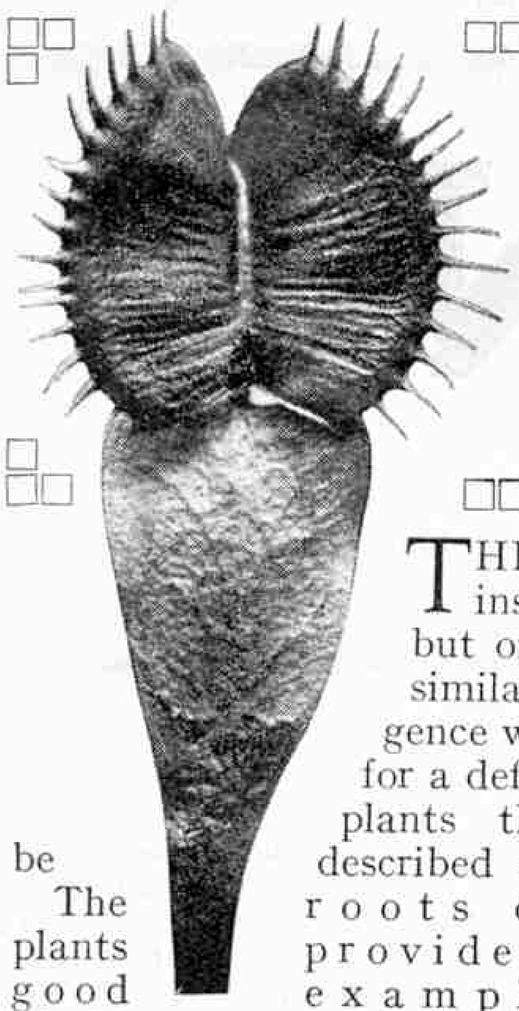
After the Armistice in 1918 His Majesty attended a Thanksgiving Service in St. Paul's Cathedral and took part in triumphal progresses through London, afterwards visiting Paris and making a tour of the battlefields of France and Flanders.

The Peace Treaty

The Peace Treaty of Versailles was signed on 28th June, 1919. This brought to an end what may be described as the first phase of His Majesty's reign, during which the very existence of his Empire had been at stake. Then followed the period of rebuilding the civic and national life, which had been completely disrupted during the War. One of the most significant steps in the new era was the pacification of Ireland after a desperate struggle lasting over many years. The first stage in the settlement was the constitution of Northern Ireland, the first Parliament of which was opened on 22nd June, 1921, by His Majesty in person. Later in the year the Irish Free State came into being, and was firmly established in 1922.

His Majesty continued to display keen interest in national and international affairs until November, 1928, when there came the first personal shadow on his reign. In that month he was attacked by pleurisy, brought on, it is believed, by his insistence on taking his usual part in the Armistice Day ceremonies at the Cenotaph in Whitehall, London, in spite of pouring rain. For long he was seriously ill, but he made a wonderful recovery, and the approach of his Silver Jubilee found him still active and vigorous, and closely associated with every phase of national life.

Within recent years he has made tiring journeys to many parts of the country and typical events of this kind were his appearance in Liverpool in July 1934 to open the magnificent tunnel under the Mersey, and later in the same year on Clydeside when the Cunard White Star liner *"Queen Mary"* was launched by Her Majesty the Queen. On these occasions his words were broadcast to millions of his subjects in all parts of the world. We shall again hear his voice on 6th May, the 25th Anniversary of his accession, and I am sure that readers then will join with me in the national prayer: "God Save the King!"



The Intelligence of Plants

Ingenious Trapping of Insects for Food

THE intelligence of animals and insects is generally accepted, but one does not often hear plants similarly credited. Yet if by intelligence we mean the doing of some act for a definite purpose, there are many plants the conduct of which can be described as intelligent.

The roots of plants provide a good example of this purposeful activity. If dry or barren soil is encountered near the surface, the roots turn aside to the nearest soil containing the moisture and nourishment needed by the plant. The numerous secondary roots that grow out of the main roots serve not only as additional feeders to the plant, but also to establish it more firmly in the ground.

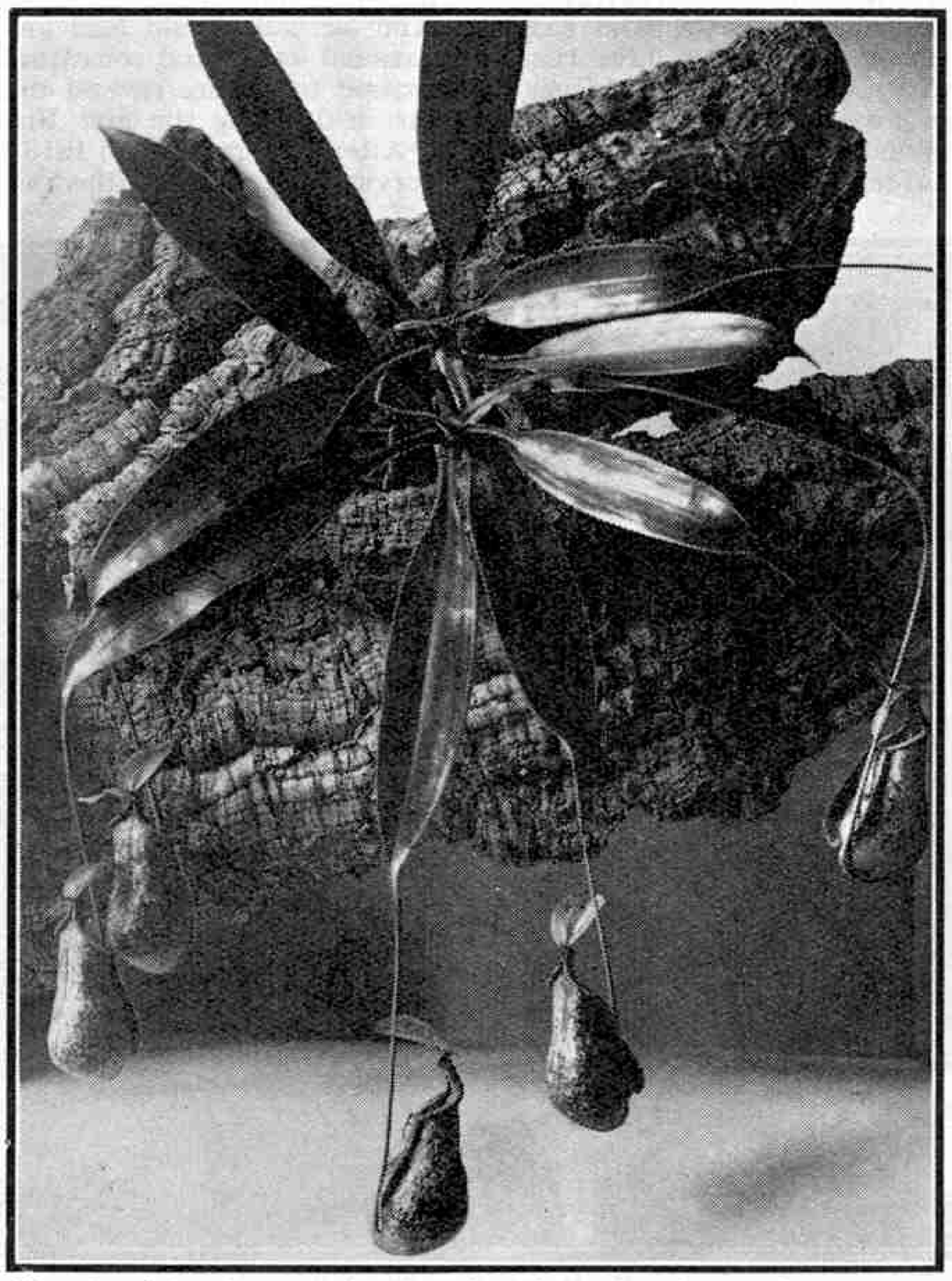
Climbing plants afford another instance of intelligence. The stems of many of these plants are not sufficiently woody in texture to be able to stand erect, and in their effort to do so they clutch at any convenient object that will give them a means of support, and attach themselves to it by twining around it slender "fingers" known as tendrils. The white bryony and the black bryony are examples of this intelligent action. Other climbing plants that attain full stature by winding successive tendrils around neighbouring objects are the nasturtium, the pea, the wild clematis, the Virginian creeper, and the vegetable marrow. Honeysuckle and convolvulus twine their stems around the objects chosen to support them. Some plants with stems too weak to stand erect spread over the ground, their stems or "runners" establishing contact with the soil at intervals by sending new roots down into it. Plants of this type, of which the strawberry is a good example, are said to have "prostrate" stems.

Another aspect of intelligence in plants is seen in their determined effort to grow taller than their immediate neighbours, so as to get as much light and air as possible. In forests, where the light is usually dim, the persistent endeavour of climbers and creepers to reach the sunlight above the trees is revealed by their exceedingly long stems which, toiling upward, often extend from tree to tree until finally they emerge into the unobstructed sunlight.

Other evidence of intelligent action is seen in the way plants respond to the light. Some flowers open so early that they greet the first rays of sun the morning with fully extended corollas. Wild roses, for instance, open between 4 a.m. and 5 a.m., and many species of flax during the next hour. Other flowers do not open until evening. Honeysuckle opens about 6 p.m., the movement beginning by the lowest lobe of the corolla folding back. The other lobes follow its example, and in this way the stamens are liberated and then spread outward. The whole process takes only about two minutes. Among other flowers that open during the evening are the evening primrose and the campian, and while these are revealing their beauty the flowers that opened during the morning are closing again, to "sleep" until reawakened by the return of daylight.

Some flowers are so highly sensitive that they will close up, not only at the approach of darkness, but even if a slight breeze blows on them, or someone shakes them, or a shower of rain falls. The Indian plant *"Oxalis Sensitiva"* is affected in this manner to an exceptional degree. It is so sensitive that the slight disturbance caused by someone walking near to it will cause the leaves to fold up. When rain occurs the first leaves on which the drops fall fold together downward, and this action is immediately imitated by adjoining leaves, while the stems bend over towards the ground. As a result of these movements the rain runs over the bent stalks and folded leaves, and drains away to the ground. When the shower is over the plant resumes its normal attitude.

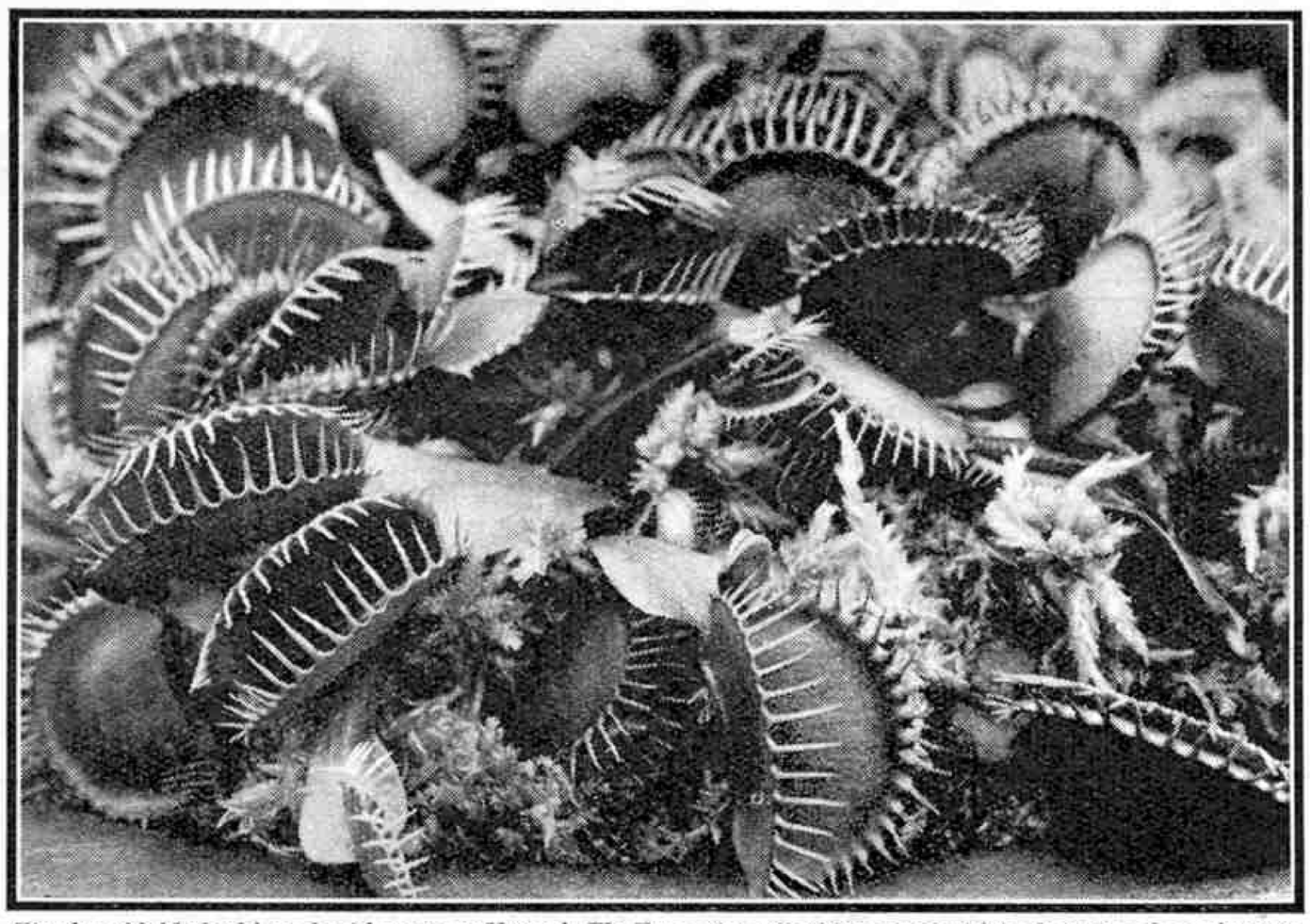
The plants of the sundew family, which are found on moorland and in boggy places, are quite indifferent to the buffetings of gales or the descent of heavy rain, but if a small insect in search of honey happens to alight on a



View of a pitcher plant, showing the curious pitcher-shaped receptacles that hang from the tip of the long narrow leaves and, in the example illustrated, are equipped with lids. The illustrations to this article are from photographs by H. Bastin.

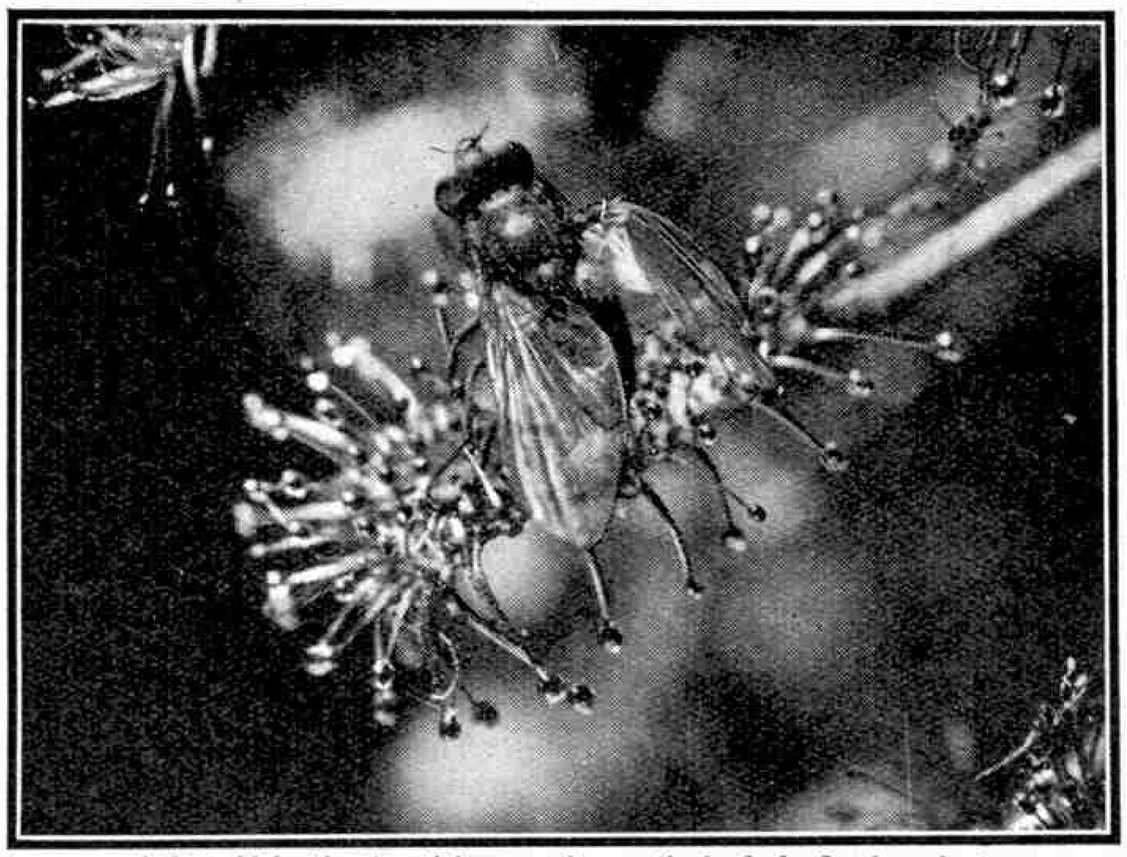
sundew leaf, the plant at once becomes alert. To appreciate the action that takes place it is necessary to be familiar with the structure of the plant. There are about 40 species of sundew, but in every case the upper surface of each leaf is covered with about 200 slender red filaments or tentacles. The filaments vary in height, the tallest being at the edge of the leaf and the shortest at the centre, and all have at the upper or free end a bulge containing a sticky glandular secretion.

The insect is doomed from the moment it lands on the leaf, for while it is held fast by the secretion, the filaments begin to bend over and close in on it, a sinister movement suggestive of the gradual closing of a hand. If it happens that two insects have alighted on the same leaf but at different points, the filaments will divide, some closing down on one insect and some on the other. The time taken for this movement to be completed varies from one to three hours. The secretion in the ends of the filaments is discharged on the insect, which in the course of the next two days is digested by the plant, the few indigestible remnants left on the leaf being blown away by the wind when the filaments return to their normal position. Usually the victims are midges, but flies, ants and even beetles may be captured and eaten by the sundew.



The formidable looking plant known as Venus's Fly Trap, the spiked leaves of which close round any insects that alight upon them. The photographs in the heading on the previous page show (left) an open leaf of the plant, and (right) a leaf in the act of closing upon an insect.

Other plants that feed on the creatures they capture are the bladderworts. These water plants have no roots, and grow suspended in the water, and the few British representatives are all found in the pools of marshy districts. The submerged fronds of the plant carry numerous hair-like leaves, some of which form small intricate bladders with an aperture at the upper end protected by bristles, and fitted with a trapdoor that opens only inward. Water fleas and other tiny aquatic animals take shelter inside these bladders, and then discover that the trapdoor prevents their exit. They soon die, and the dissolved substances of their bodies are absorbed by cells that line the inner surface of the bladders. When the plant is in flower the bladders fill with air, and in this manner float the plant sufficiently to raise the blossoms above the water so that insects can reach and fertilise them.



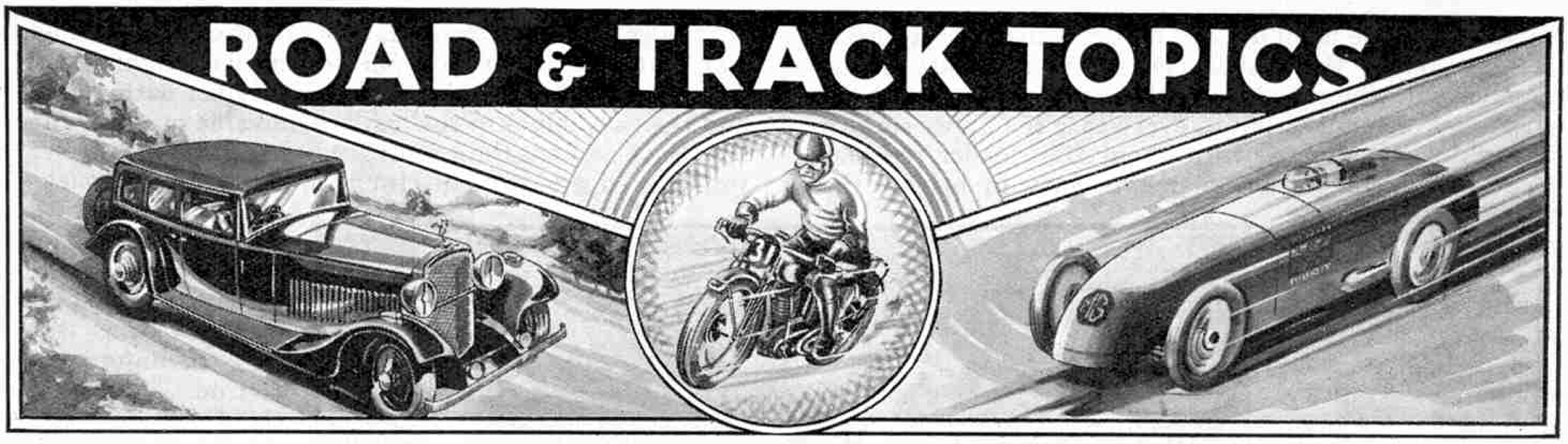
A fly held fast by the sticky secretion on the leaf of a Sundew plant.

The plant known as Venus's fly trap, a native of the peat bogs of North Carolina, bears on each stem a single leaf that can close round any insect that alights on it. The upper surface of the leaf is thickly set with glands, and the two halves of the leaf are movable on the centre rib. Each half has three sensitive hairs, and spikes project from the edge of the leaf. Immediately an insect touches one of the hairs the two halves of the leaf rise and draw together, and the spikes interlock, thus trapping the unfortunate victim. The glands then exude their digestive juice on the insect, which is soon absorbed.

Equally expert insect catchers are the pitcher plants, which owe their name to the shape of the curious receptacle that hangs from the tip of each long narrow leaf, and in some plants is equipped with a lid. The bright colours of these pitchers, and the sweetness of the nectar secreted in certain glands, attract insects, which find, too late, that the inner surface of the pitcher is so slippery that they cannot retain their foothold. Eventually they fall to the bottom of the receptacle, where they are caught in a sticky secretion and subsequently digested.

The explanation of the un-plantlike behaviour of these insect catchers is to be found in the fact that they grow in soil that is lacking in the nitrates that form an essential part of plant food. The bodies of insects are rich in nitrogen compounds and thus the deficiency is made good.

The intelligence of plants is displayed also in the clever means many of them employ to distribute their seeds. Perhaps the simplest method of seed dispersal is that of the dandelion and the thistle. The flowers of these plants mature into large fluffy seed balls, which are so light that the seeds are carried far and wide by the wind. The grapple plant adopts different tactics. Its seeds are contained in a peculiarly-shaped husk that has several long arms terminating in tiny hooks, which catch in the fur of passing animals, who thus carry the seeds away with them. The seed pods of the maple, sycamore, ash and lime are literally miniature gliders, for they are equipped with wings that enable them to drift with the wind. Many plants do not depend on the wind or other outside agency to disperse their seeds, but themselves fling them into the air. In some plants the seeds are contained in long slender (*Continued on page 316*)



A New Motor Tyre Safety Tube

A remarkable experiment with a new type of inner tube for motor car tyres was recently carried out at the Floyd Bennett Field, New York, by the Goodyear Tire and Rubber Co. Inc., of Akron, Ohio. The new tube is designed specially to eliminate the serious accidents that frequently follow a puncture or burst when travelling at high speed, and the experiment proved conclusively that the tyre does accomplish this purpose. While a car fitted with the new tubes was travelling at 60 miles per hour several of its tyres were deliberately punctured, and in every case the driver was able to bring the car to a stop in a normal manner under complete control.

The new tube, a sectional illustration of which appears on the opposite page, is of radically different construction from anything previously attempted. Actually it consists of two tubes, one inside the other and joined together at the base, with a single vent hole connecting the two air chambers. The outside tube is similar in function and appearance to an ordinary tube and fits against the inside of the tyre, while the inside tube or "lung," which is built of two plies of fabric, floats free without chafing. The tube is inflated in the usual manner, the vent hole permitting air to pass from the inner chamber to the outer chamber so that in ordinary service the inner carcass is under no strain, but simply floats free inside the tube.

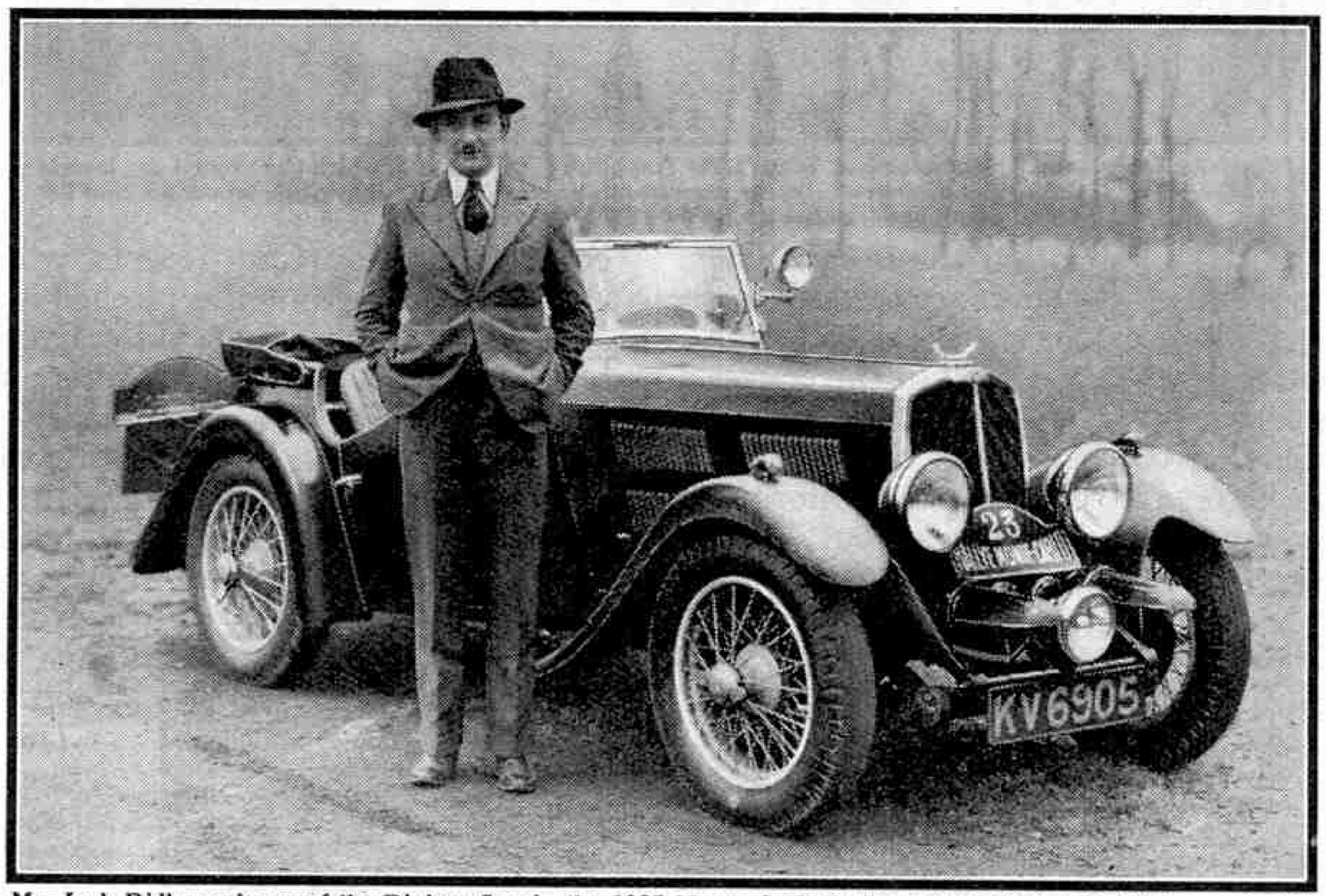
When a puncture occurs the air escapes from the outside chamber immediately, but it can escape from the inner chamber only through the single small vent hole. As the result only a portion of the air is lost immediately and the tyre drops down slightly to ride on the inner fabric carcass, which loses its air very slowly. This permits the car to continue under perfect control, and allows the driver ample time to stop without endangering himself or other motorists. In effect, the new tube converts a sudden puncture into a slow leak.

Before the official demonstration hundreds of tests were conducted in which tyres were blown out at high speeds by using dynamite caps, or by running the wheels over plates studded with large spikes, but in each case the tube allowed the driver to continue on a straight course down the highway in absolute control of his car.

British Successes in the Monte Carlo Rally

British cars and drivers scored a distinct success in the 1935 Monte Carlo Rally, and for the third time, and for the second year in succession, a British small car won the Riviera Cup, which is the chief prize in the under 1,500 c.c. class. In addition six British drivers and seven British cars were in the first 10 in the small car class, and the successes enumerated do not include awards gained by British drivers on American-designed cars, one of whom was J. W. Whalley, who finished fifth in the general class with a Ford V8.

The Riviera Cup was won by a Triumph-Gloria car piloted by Mr. Jack Ridley, who is shown with his car on this page. Mr. Ridley, who started from Umea, Sweden, covered 2,350 arduous miles, and it must have been a thrilling moment for him when he received his trophies in the courtyard of the palace of the Prince of Monaco. Mr. Ridley's course passed through Sundsvall, Stockholm, Helsingborg, Copenhagen, Odense, Hamburg, Hanover, Brussels, Paris, Avignon, Brignoles, and so to Monte Carlo, the finishing point, which was reached after five days and four nights of strenuous endeavour. That Mr. Ridley, besides winning the Riviera Cup, should have secured second place in the whole Rally, irrespective of class, is a remarkably fine accomplishment.



Mr. Jack Ridley, winner of the Riviera Cup in the 1935 Monte Carlo Rally, and the Triumph-Gloria car that he piloted to success. Photograph by courtesy of the Triumph Co. Ltd., Coventry.

Rupert Riley, driving a Riley M.P.H., was one of the unfortunate competitors who came to grief, and he had a remarkable escape from death when his machine skidded and ran over the edge of a 500 ft. ravine in Greece. Fortunately the car came to rest 50 ft. from the road and Mr. Riley and his companion, Mr. Colin Richardson, were able to scramble out.

Singer, Riley, and Lagonda cars all worthily upheld British prestige in the great Rally. None but thoroughly efficient and reliable cars stand much chance in this great international event, in which after covering more than 2,000 miles of difficult roads the cars have to pass drastic tests of easy starting after a night in the open, acceleration, brakes and steering.

Interesting German Cars at the Berlin Show

An International Motor Show was held recently in Berlin, and the exhibits comprised motor products of all kinds. Although the show was termed "international," the exhibits were mainly German products.

The Exhibition was opened by Herr Hitler, the German Leader, who spent some hours visiting the various stands, and an outstanding feature was the number of engines shown that were designed for working on fuels other than petrol. Many vehicles exhibited were equipped with gas producers, and one lorry had two producers, which were neatly accommodated at the sides of the vehicle behind the cab. Buses were on view with gas producers mounted within the bodywork at the rear, and one machine had a producer working in conjunction with what was originally an oil engine, suitably modified by employing a special head with sparking plugs and magneto ignition.

Another vehicle had a six-cylinder engine, with two carburetters that employed coal-gas as the fuel. The gas was stored at high pressure in three large cylinders fitted with valves to reduce its

pressure to that required for use in the engine.

Special interest was taken in the Tatra 77, a car planned on unusual lines. It has a V eight-cylinder air-cooled engine, and a tubular "backbone" type of frame, comprising a member of square section running down the centre of the car, to which the body is attached. The car is designed for high speed and comfortable travel, and it has a maximum speed of about 90 m.p.h. with correspondingly high cruising and average speeds.

The engine, which is placed in the rear, is covered by a hinged lid that forms the tail of the car, and is a remarkably compact unit. In external appearance it is unlike almost any other existing type of car engine. There are two banks of four cylinders set at an angle of 90 degrees one to the other, but the V construction is not immediately apparent. Overhead valves are operated directly from a centrally situated camshaft, and the cylinders are surrounded as a whole by a jacket, which is open on the one side to allow the entry of cooling air delivered under pressure from a sirocco fan, and at the other side to permit the exit of the heated air after it has done its work. There is a four-speed gear-box for second, third and the direct top gear, but no synchromesh or other form of easy gear change is employed. Spare tools can be carried in the nose of the car, which also provides accommodation for the reservoir of the hydraulic brake system.

An interesting example of streamlining applied to a modern motor coach. The photograph shows the "Aerstreme" Luxury Coach manufactured by Fodens Ltd., Sandbach, to whom we are indebted for our illustration.

Proposed Motor Road Races at Southport

A scheme for a three-days' motor road race meeting is under consideration by the Southport Publicity and Attractions Committee as part of the movement towards a brighter Southport. It is proposed to hold the races on September 12th, 13th and 14th, using as a circuit the Marine Bridge, Marine Drive, Esplanade, Weld Road, Rotten Row, and the lower Promenade. At present the scheme is in its infancy, but it is planned to make it an open event to amateurs as well as professional drivers on an international scale.

If the scheme is approved the Southport races would probably rival the Manx Mannin Beg and Mannin Moar races and those held in Belfast, and the course proposed should prove an ideal one for high speeds to be recorded. There would be ample accommodation for spectators on the shore, which lines practically the whole length of the Esplanade and the Marine Drive. The only circuit anything like that proposed at Southport is Donington Park, and while there are no hills like those in the Isle of Man, the road surfaces are better and competitors would not have the trouble of transporting their machines across water.

Motor road racing is not new to Southport, for nearly thirty years ago, when motor cars were in their infancy, racing events were held on the Southport Promenade.

Traffic Safety Regulations Abroad

The introduction of the Belisha beacons and the 30 m.p.h. speed limit makes it interesting to compare the traffic regulations in force in this country with those existing in various foreign countries.

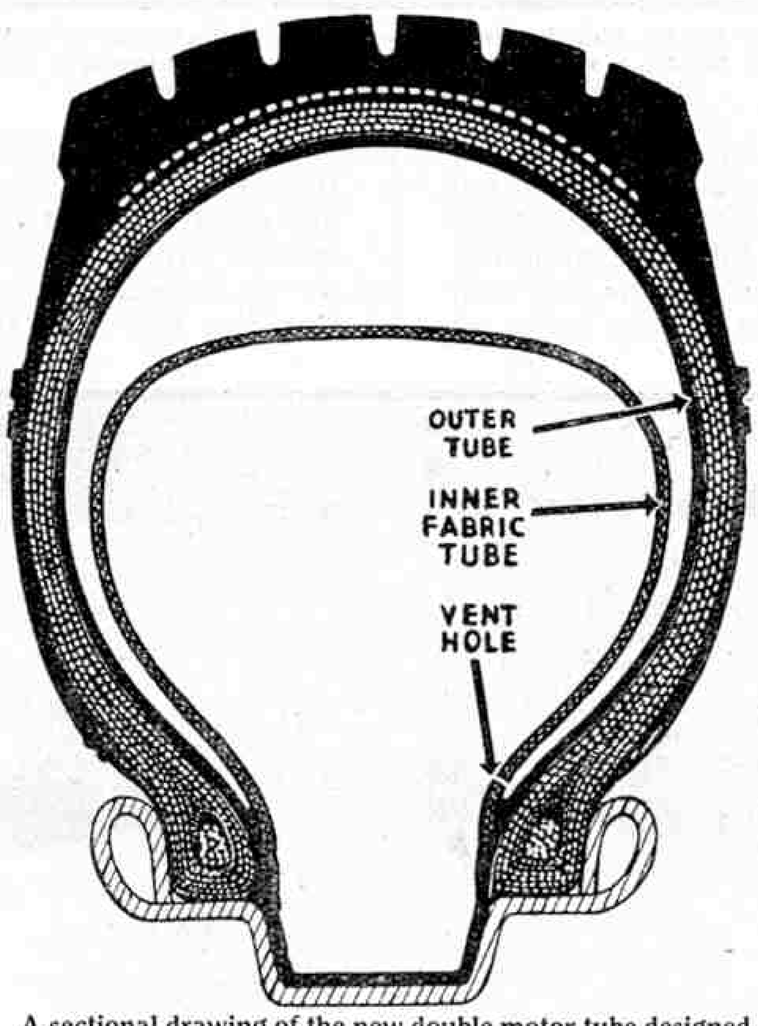
For example, "crossing studs" have long been in use in Paris, where even the taxi drivers, who have the reputation of being the world's most joyous "motor bandits," treat them with the greatest respect. Rome had her "Silent Night" for a year before it was suggested in London, and Stuttgart has had a 24-hour ban on hooters in operation for over a year, yet daytime traffic moves quite freely. Barriers at busy corners are well established in Berlin, and in some of the busiest thoroughfares there are fences down the centre with openings only at cross streets. Speed limits are almost universal in built-up areas, and every Continental country has a driving test. Some of the tests are mere matters of form, but others, particularly in Italy and Germany, are of such a nature that it is doubtful if a great many of our so-called "experienced" drivers could pass the inspector.

It has always been good advice to pedestrians to walk facing oncoming traffic. In Rome, in the two principal city streets, this is compulsory. The pavements are rather narrow and pedestrians are tempted to step into the roadway when passing others; but the pavement traffic is strictly "one way," and police are stationed at busy corners to see that all move in the same direction. This arrangement makes shopping a tiring job as one may have to zig-zag back and forth across the streets several times in order to complete one's purchases. In Brazil the natives in the unlit country districts invariably wear a white coat or a white shawl when abroad at night to avoid risk of being run down.

A Mechanical Ear

At the factory of Armstrong Siddeley Motors Ltd., Coventry, there is an insulated chamber in which motor car units are tested for silence. But they do not trust the human ear to detect noise; there is a "mechanical ear," a microphone arrangement that registers the slightest jar. The instrument is so sensitive that if one speaks while in the room the dial of the instrument registers the vibrations of the voice.

Another factor in ensuring the high perfection of this firm's cars is a casting "weathering" process. An ordinary casting, when first cooled, is under diverse strains, which in course of time disappear as its component molecules settle down into a homogenous structure that will not become distorted when machined. During the weathering period the castings are left exposed to the elements, so that they become covered with red rust and sometimes they are partially cut, to help the settling process. For very special jobs castings are sometimes allowed to weather for as long as three years.



A sectional drawing of the new double motor tube designed to eliminate the dangerous results of "blow-outs" when travelling at high speed. Photograph by courtesy of the Goodyear Tire and Rubber Co. Inc., Akron, U.S.A.

Forthcoming Events

Among the many interesting motoring events arranged for the near future are the Mannin Beg and Mannin Moar Races in the Isle of Man, which will be held on the 29th and 31st of this month respectively. The Mannin Beg Race was first run in 1933, and each year attracts big crowds to Douglas, the scene of the contest. The event is for cars of up to 1,500 c.c. capacity, and the course of $3\frac{1}{2}$ miles, including three acute bends, has to be covered 50 times by the competitors. The Mannin Moar Race is over the same course, but is open to cars of any capacity.

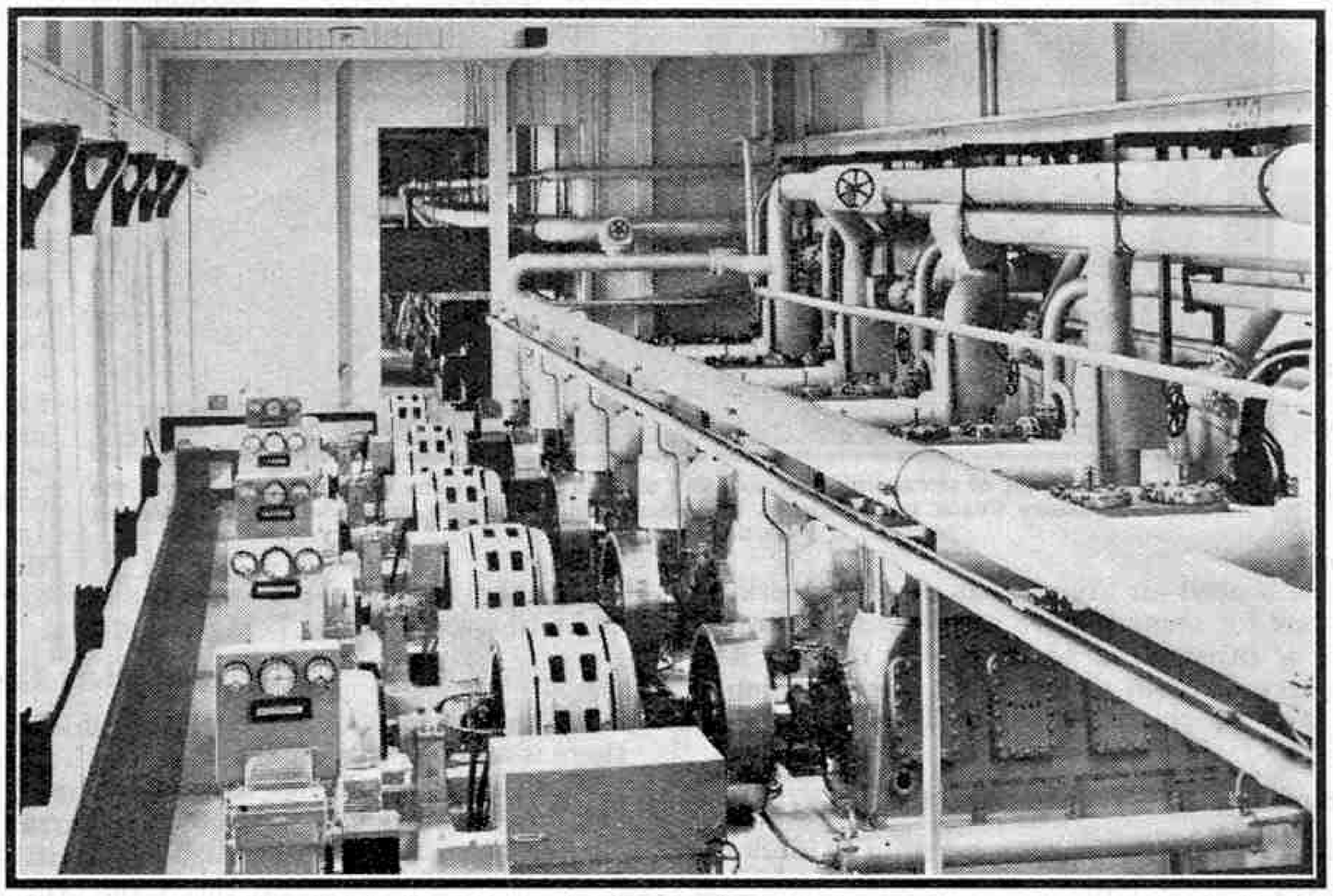
Important events in June are the M.C.C. London–Edinburgh Trial on the 7th–8th, the R.S.A.C. Scottish Rally from the 10th to the 14th, and Le Mans 24 Hour Race on the 15th and 16th. The London–Edinburgh Trial, which is organised by the Motor Cycling Club (M.C.C.), is the oldest of all trials, and the course lies over road surfaces of all kinds and gradients of all degrees. Last year the route covered was about 470 miles in length.

The Scottish Rally competitors have to cover about 1,000 miles of a very difficult route in Scotland.

Great Britain's Largest Ice Factory

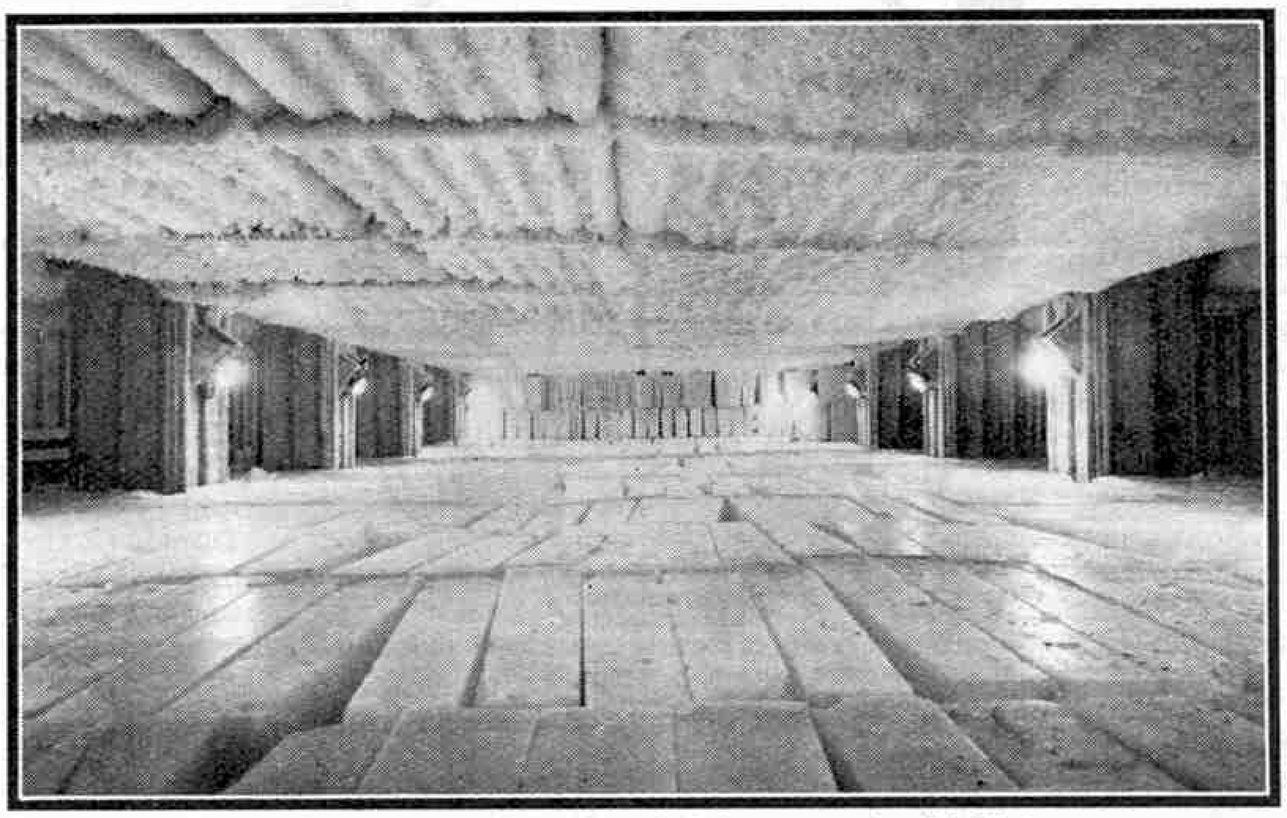
Producing 220,000 Tons of Ice a Year

LARGE quantities of ice are now required for the preservation of perishable foodstuffs, especially fish, and its manufacture is one of the most interesting and important of our modern industries. The quantity of ice used on trawlers and other vessels for keeping fish in good condition is so great that enormous factories for its production have been built at the ports. One of the largest of these is that of the Hull Ice Co. Ltd., at Hull. This has an annual output of more than 220,000 tons of ice, which is produced in a factory that includes eight separate plants, all in one building, five of which have recently been modernised by The Liverpool Refrigeration Co. Ltd.



The engine room at the Hull Ice Co. Ltd. showing the five "Polar" sleeve valve compressors, each of which is driven by a General Electric 380 b.h.p. synchronous induction motor. Photographs to this article by courtesy of The Liverpool Refrigeration Co. Ltd., Liverpool.

The use of ice for preserving foodstuffs is not new. More than 2,000 years ago Alexander the Great had huge trenches dug and packed with snow in which to store wine, and it is said that the wine of the Emperor Nero was cooled by snow carried down from the Alps by thousands of slaves. In parts of the United States it used to be the custom to cut blocks of ice in winter from the frozen surfaces of lakes and ponds and bury them in thick layers of sawdust, which protected them so well that they could be used for cooling purposes during the following summer. A little more than a century ago North American ice was exported to tropical countries, and blocks cut from the frozen lakes of Massachusetts were carried in ships to the West Indies, and even as far as Calcutta, in India. In order to reach the latter place the ships that conveyed the ice actually crossed the Equator twice. The arrival of the first cargo in Calcutta created a sensation among the natives, many of whom bought pieces to hold in their hands. Their enjoyment of the cooling effect continued until the ice melted, and it is said that many of them then indignantly demanded the return of the purchase price!



The Ice Store at the Hull Ice Co. Ltd. It has a capacity of 1,200 tons.

A striking proof of the value of low temperatures in preserving foodstuffs was given a short time ago, when the body of a mammoth dug out of the frozen ground in Northern Siberia was found to be as fresh as if it had just been killed. Its flesh was still eatable, although it sank into a frozen Siberian marsh to die at least 20,000 years ago. This is the third occasion on which such a discovery has been made, and so efficient had the natural refrigeration been in each of the two previous cases that the meat of the mammoths actually was eaten at special banquets, and declared to be "succulent, but a bit tough."

To-day we are no longer dependent on ice formed on our streams and ponds during winter, for the ice that is required for preserving meat, fish, fruit and other products is more readily and cheaply obtained in factories such as that dealt with in this article. The water from which the ice is made is cooled below freezing point by a simple process in which a liquid is evaporated and the gas produced from it is allowed to expand. Both processes bring about a lowering of the temperature in the immediate neighbourhood of the liquid undergoing them, for heat is necessary to transform the liquid into a gas and to cause it to expand. Compressing the gas or condensing it into liquid form has the opposite effect.

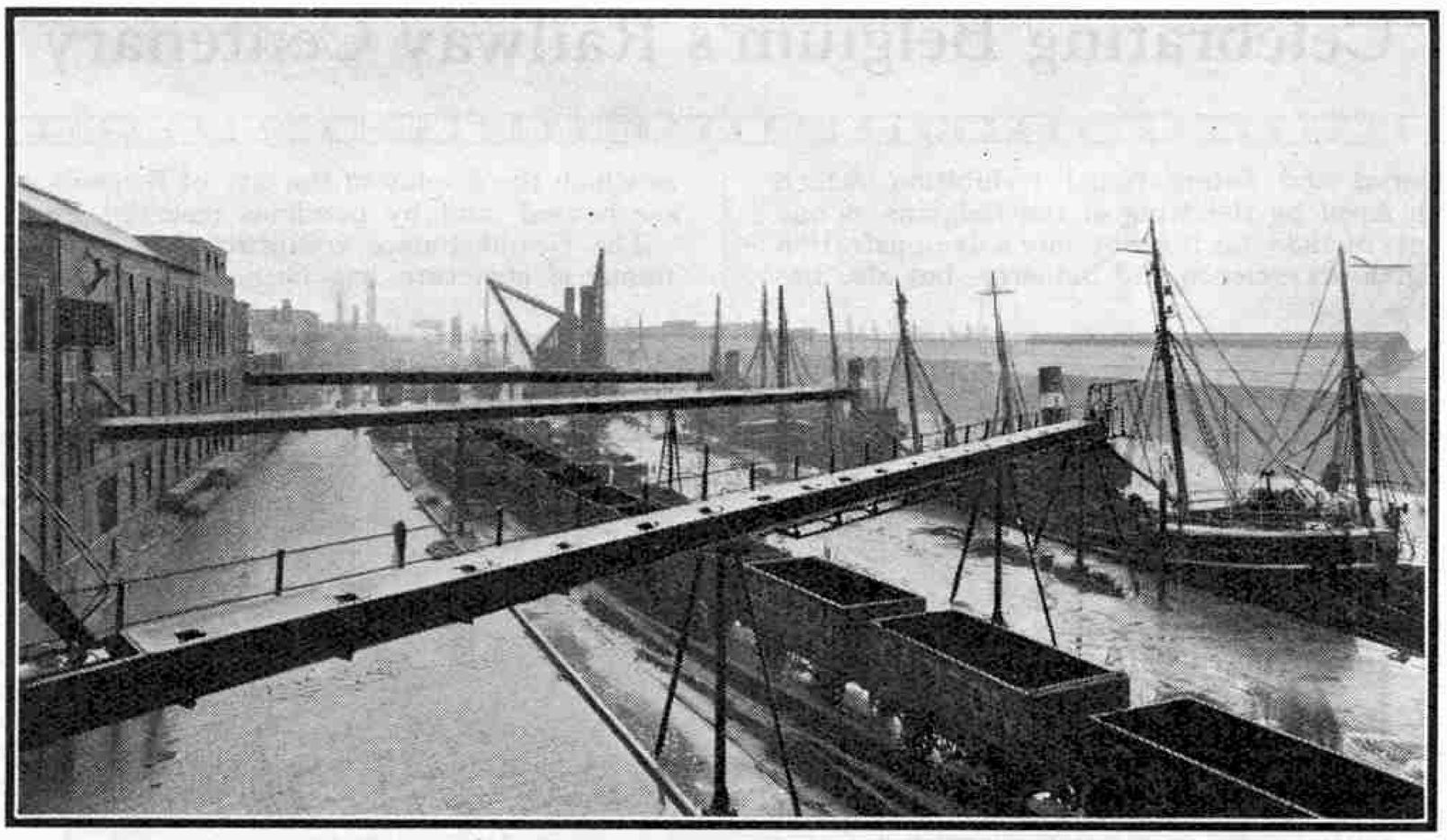
On a small scale the cooling effect of evaporation is shown by the lowering of the temperature of the carburetter of a motor car when the engine is started, for the suction converts the petrol into vapour and heat is absorbed in the process. In modern cars this effect is overcome by circulating hot water round the carburetter. Similarly, cooling results when the air in an inflated tyre is allowed to escape through the valve. The effect of compression is more often met with, however, and any reader who has filled the inner tube of a tyre by means of a pump will know that the tube connected to the valve becomes hot.

Ammonia is widely used in refrigerating plants, in which it passes through a simple cycle of expansion and compression. Liquid ammonia is the starting point of the cycle. The pressure on this liquid, contained in what is called an evaporator, is reduced, and it then becomes a gas, which is allowed to expand, when it absorbs heat from its surroundings. It is in this part of the cycle that the water to be converted into ice is cooled below freezing point. This takes place indirectly, however. The evaporation and expansion of the ammonia abstract heat from strong brine that is circulated round the coils or tubes of the evaporator, and the cooled brine is then pumped through the ice-making plant, passing round moulds containing fresh water that is changed into ice in the form of large blocks.

The expanded ammonia is next compressed and condensed into liquid form, the heat developed being absorbed by means of a stream of cold water circulating round the condenser, and is then

returned to the evaporator. The entire process is continuous, for just as the ammonia passes repeatedly through a cycle of operations, so also the brine circulates steadily from the cooling plant to the ice-making tank and back again.

Ammonia is employed as the refrigerating agent at the great factory of the Hull Ice Co. Ltd. Originally the plant consisted of horizontal ammonia compressors driven by belts from electric motors, but these have now been replaced by a central refrigerating plant consisting of five high-speed "Polar" sleeve valve compressors, direct driven from electric motors. In this arrangement the losses due to belt drives and piston rod glands are eliminated, in addition to which other technical advantages have been obtained. The new equipment has increased the output of the five plants in which it has been installed from 396 tons to 695 tons in a day of 24 hours, and the change was made in a period of three months without interfering with the normal output of ice.



A view of St. Andrew's Dock, Hull, showing three of the five conveyors at the Hull Ice Company's factory transporting ice to trawlers at the rate of 60 tons per hour each.

The compressor room is in a central position in regard to the various tank rooms, and owing to the distance between these, and their disposition, considerable care had to be expended on the pipe work. This was built in sections as each machine was installed and each factory converted. All joints in the ammonia mains and connecting pipe work were electrically welded in position, and so satisfactorily was this work carried out that not a single faulty weld was detected when each circuit was completed and tested.

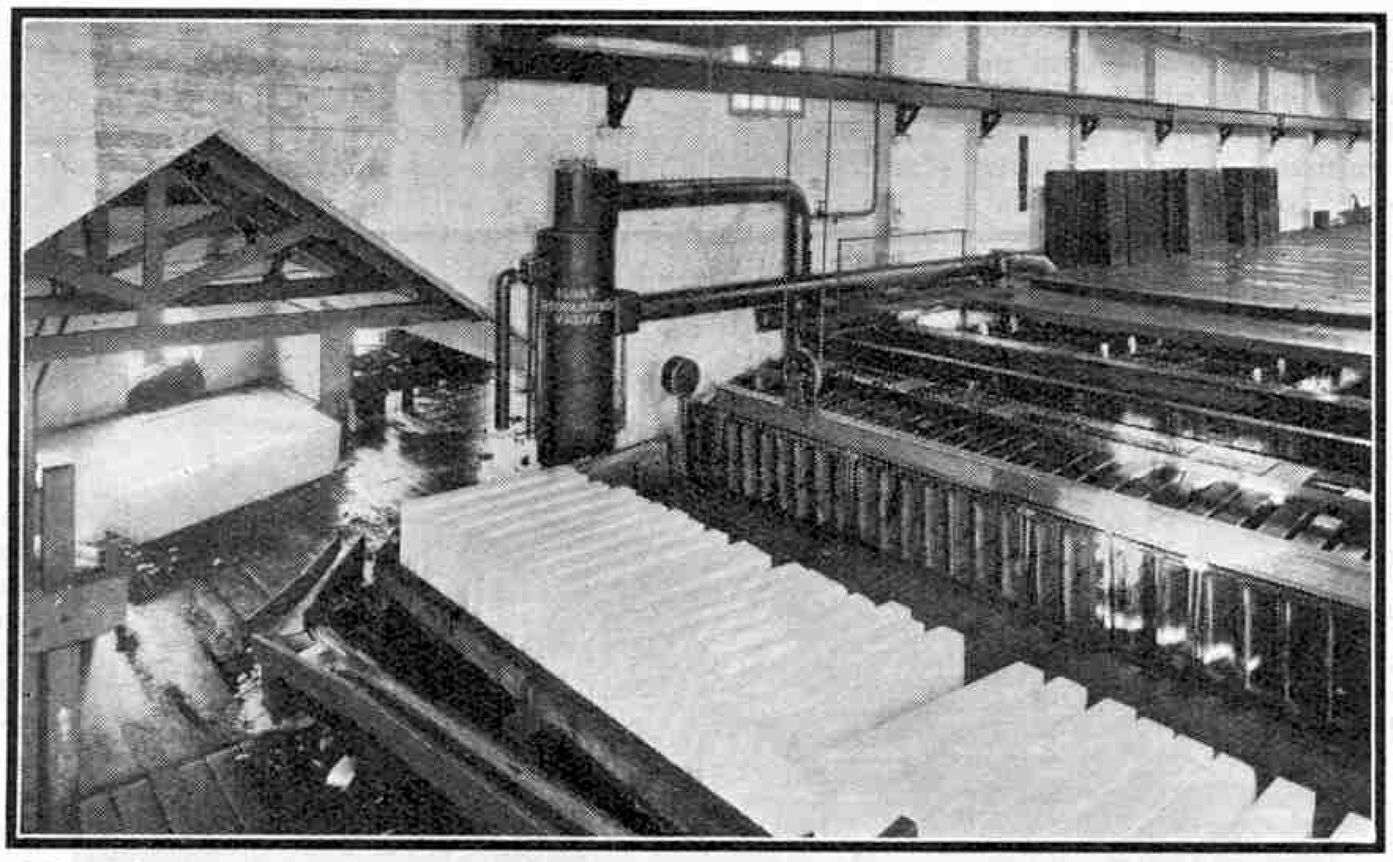
The layout of the plant was designed so that each compressor could operate independently on its own ice-making tank, or in conjunction with the others on a common main supplying all the tanks, crossover connections being provided for the purpose. Under this arrangement, for example, No. 2 Machine might work on No. 5 Tank or on No. 3 Tank.

The compressors themselves are of the latest and most efficient type of high-speed single-acting machines. All are of the same size, and they are of the totally enclosed vertical monobloc type with four cylinders, designed to operate on the double suction principle, with two different pressures. The low pressure ammonia comes from the brine coolers, and the second line, in which the pressure is higher, is fed with gas from a primary evaporating system, which will be described later. Cross connections are provided between the pipe lines in order to make the system as flexible as possible, and also between the suction and discharge lines of each compressor for pumping out operations, and to provide a means of unloading the compressor when starting up.

The cylinders and crankcase of each machine are made in one casting of special nickel iron. Each cylinder is fitted with a liner of spun cast iron and an internal safety head that is held in place by heavy springs under the top cover, which is made of steel. The safety head carries the automatic discharge valves, which are loaded with light springs that ensure instantaneous closing. A sleeve valve that controls both first and second suctions slides between the liner and the piston, and is operated continuously by means of eccentrics on the webs of the crankshaft.

The pistons are of nickel alloy cast iron and are machined all over externally, and ground on their wearing surfaces, piston grooves and gudgeon pin holes. The piston rings are of the highest quality cast iron and include two patent oil scraper rings to each piston. The gudgeon pins are of hollow high-grade steel, case hardened and ground and securely locked in the pistons by hard steel dowel pins. The connecting rods are of forged steel circular section, machined all over, with bottom ends of the marine type. They are fitted with renewable steel bushes made in halves, and the crankshafts are made of Siemens Martin steel, forged solid in one piece.

All running parts are fed with oil under pressure from an oil pump under a small cover at the end of the crankshaft. At the flywheel end the crankshaft passes through a stuffing box in which is a special white metal packing that also is lubricated by forced feed. An external oil strainer is fitted into the oil pipe line. This can be cleaned while the machine is running, and a device fitted in the top cover makes it a simple matter to replenish the oil in the crankcase, which can be observed through sight glasses.



A 5-ton tip of ice being delivered from the ice tanks. The block of ice passes directly to the conveyors shown in the upper illustration on this page.

The suction manifolds are designed specially to ensure equal distribution of the gas to each of the cylinders, and the general appearance of the machines is unusually compact and symmetrical. Large side doors and end covers on the crankcase provide ample means of access to the internal motion.

The driving motor of each compressor is of the synchronous induction type manufactured by the General Electric Co. Ltd., London. It operates on 3-phase 50-cycle alternating current at 400 volts, and is rated at 380 b.h.p. Its designed speed is 375 r.p.m. Special precautions have been taken with the insulation. The windings of the motor are moulded in mica, and the overhang is further protected by a special tape coated with a fume-resisting varnish.

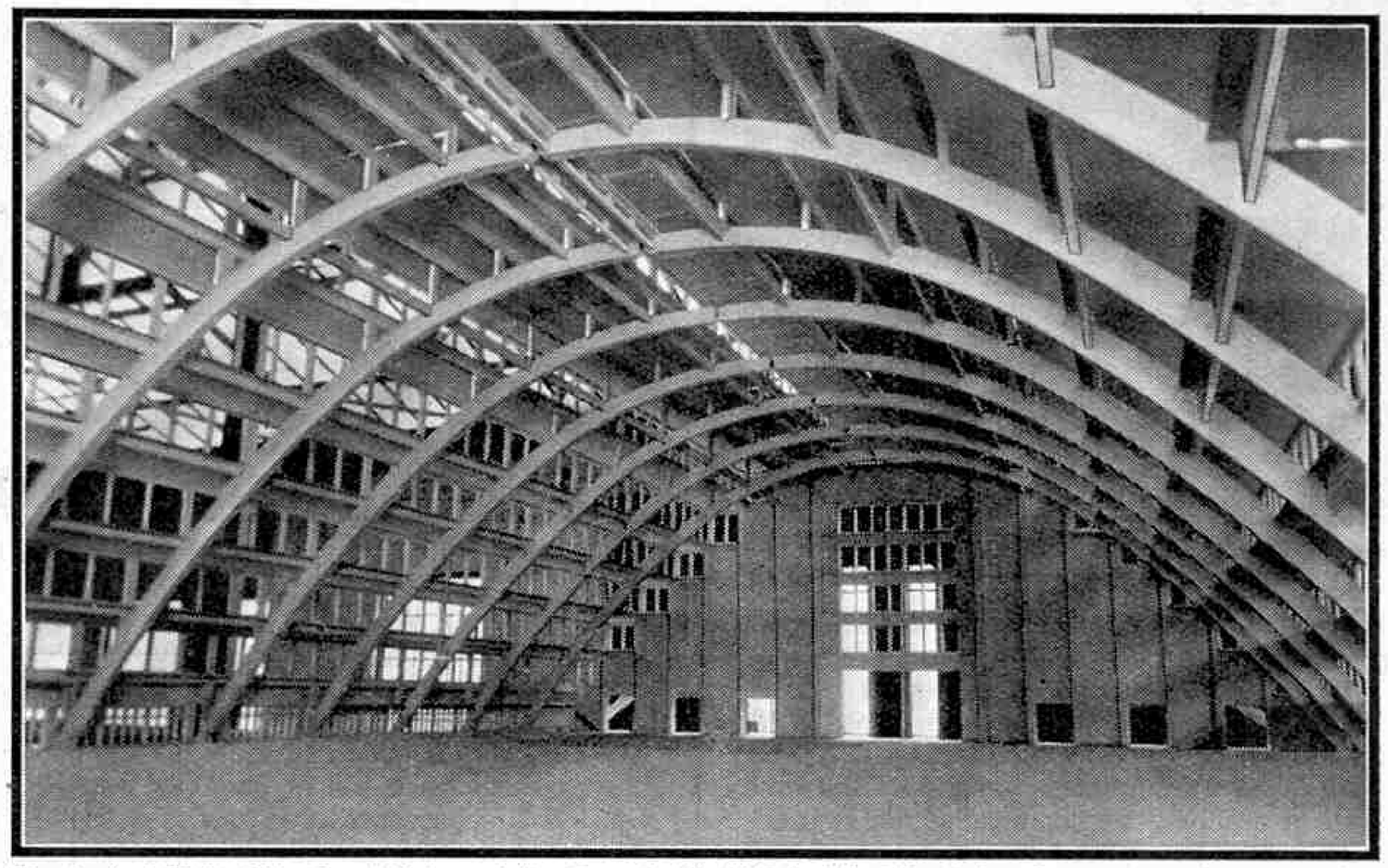
Current supplies for the motors are taken through two sub-stations, in each of which there are two 500 kVA step-down transformers, and these stations are electrically interlinked through circuit breakers on both the high-tension and the low-tension sides in order to reduce idle time in the event of breakdown. The whole of the electrical installation work, including the erection of motors, switchboards, starters, and the laying of all cables and wiring, was carried out by the Hull Ice Company's own staff, under the supervision of their electrical engineer.

In a room adjoining the engine room are *(Continued on page 316)*

The Great World Fair at Brussels

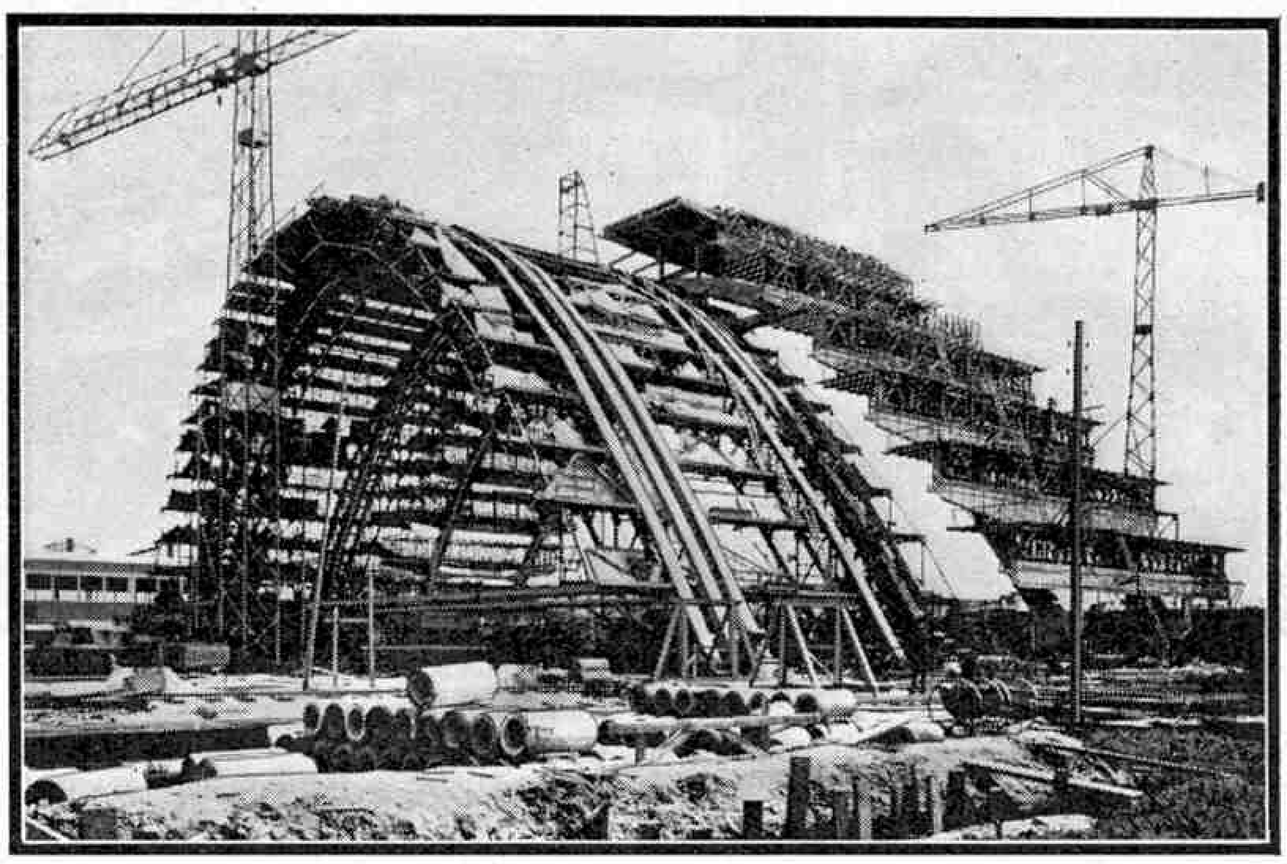
Celebrating Belgium's Railway Centenary

THE Brussels Universal and International Exhibition, which was opened on 27th April by the King of the Belgians, is one of the outstanding events of 1935, for it is not only a demonstration of the strength of Belgian art, science and industry, but also has brought together the products of 30 countries, who are co-operating in the great Belgian enterprise by erecting pavilions and filling them with characteristic national products. This great World Fair is the climax to the celebrations of the National Centenary of Belgium, which proclaimed its independence on 14th October, 1830. It commemorates also the 100th birthday of the first railway on the Continent, connecting Brussels with Malines, and the Jubilee of the Belgian Congo, Belgium's great African empire, which was founded as an independent state in 1885.



The Central Hall of the Grand Palace at the Brussels World Fair. The 12 reinforced concrete arches supporting its roof have a span of 282 ft. and are the largest of their kind in the world. (Photographs, Stone.)

The Brussels International Exhibition is regarded as the most important World Fair since that of Paris in 1900. The scene of the display is Osseghen, one of the most beautiful parts of Brussels, and near the Royal Palace, Laeken, the summer residence of the King and Queen of the Belgians. The grounds cover more than 360 acres and form a plateau encircled by a magnificent wooded avenue planned by King Leopold II. They are ornamental in character, for plantations, lawns, gardens and lakes add to their attractiveness, and more than 40 acres of forestal park are being retained intact within the grounds. From the highest point of the plateau, where the principal buildings have been erected, visitors will obtain a wonderful view of the Belgian capital and its suburbs.



Building the giant arches of the Central Hall. The first pair are just completed.

The Exhibition has been planned on a gigantic scale, and the magnificent structures in which the exhibits are displayed are separated by wide roadways intersecting to form squares decorated with luminous fountains. The main artery of the Exhibition is Centenary Boulevard, which slopes gently upward from the main entrance towards the Grand Palace, the greatest of the Exhibition buildings, erected on the highest part of the plateau. On the right near the entrance is a magnificent reconstruction of the Brussels of the 18th century, which provides a wonderful contrast with the modern city; and this is followed by the immense park already mentioned, in which is a great open air theatre. For the rest of its course this Boulevard is flanked by the buildings in which the display of the city of Brussels and the French section are housed, and by pavilions reserved for Belgian organisations.

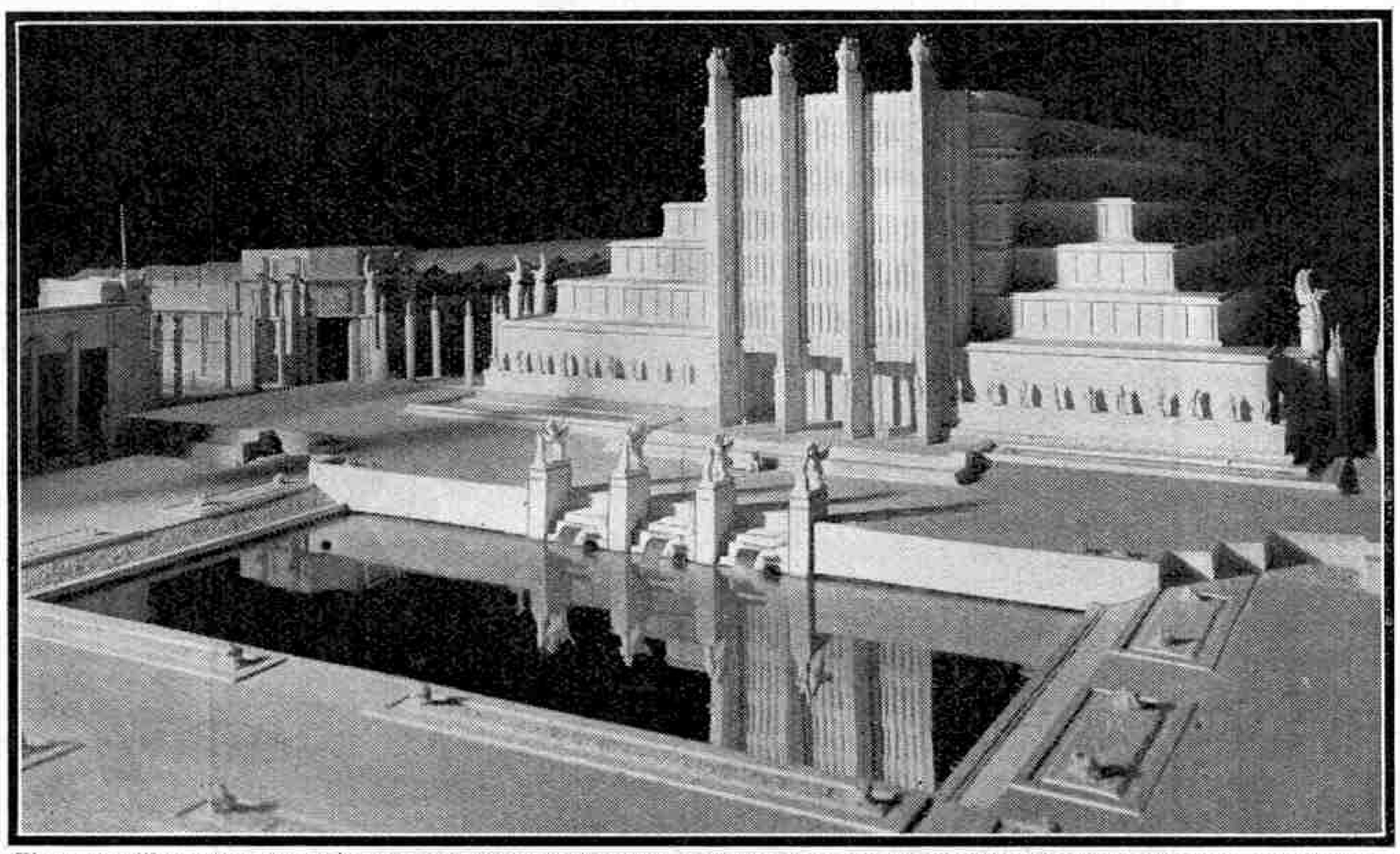
The Grand Palace comprises five magnificent buildings. This immense structure has been reserved for an International Exhibition of railway material, and on each side of it, separated from it by magnificent lawns, are halls devoted to engineering exhibits and to the displays of the public services of Belgium. The Grand Palace itself has been turned into a model railway station. Visitors obtain their admission tickets at a booking office window, and on the main railway line find a faithful reproduction of the first train that ran on the Brussels-Malines line opened in 1835, with officials and passengers dressed exactly as were those of that period. By way of contrast visitors are able to inspect the most modern types of rolling stock from various European countries.

In a short article it is impossible to give a complete account of the many features of an extensive World Fair of this kind. The exhibits on view are displayed in magnificent reinforced concrete buildings of modern design, and at night these will be appropriately floodlit. Special mention may be made of the great Entertainment Hall and the Palace of Ancient Arts, where Belgian masterpieces of the last 500 years are assembled; and the immense Sports Stadium, with accommodation for 75,000 spectators. A large and splendid building with an immense tower is devoted to the Congo exhibit, which gives an adequate idea of the immense variety of products that are obtained from Belgium's great African empire, and of native life in that region; and other pavilions contain displays organised by practically every European country.

The British contribution is exhibited in a great circular hall, approached by steps guarded by British lions. On top of the building is a 600 million candle power beacon with six beams that can be opened out to form a gigantic fan of light, or combined into a single powerful shaft of light. The beams are coloured and are used for making patterns and letters of light in the sky. In the pavilion there is an immense map of the world showing how day and night alternate in the widespread parts of the British Empire, and other exhibits reveal the wonderful progress that has been made in aviation, telegraphy and radio, and in the

engineering and chemical industries of the country. Galleries branching out from the pavilion itself lead to a beautiful garden in a hollow that has been described as an exquisite corner of old England.

The extensive use made of reinforced concrete in the construction of the Exhibition buildings is of special interest, for Belgium was the birthplace of this valuable building material. The first block of reinforced concrete was produced by François Hennebique as long ago as 1879, when that pioneer was constructing a villa at Lombartzijde on the Yser. Hennebique later perfected his process, and in 1892 he took out an important patent for girders constructed of reinforced concrete. Since that time all world fairs, such as that now being held in Brussels, have made use of reinforced concrete in the construction of important buildings, and today gigantic skyscrapers, and even bridges and viaducts, are made of it.



The upper illustration shows the main entrance to the Fair, with the reproduction of Old Brussels on the right. (Photograph, L'Epi-Devolder.) The Grand Palace is seen in the lower illustration. (Photograph, Stone.)

From the structural point of view the central feature of the Brussels Exhibition is the Grand Palace. The entire building covers an area of nearly 500,000 sq. ft., and the Central Hall, its most striking feature, is 540 ft. long and 295 ft. wide. In spite of its great width, there are no obstructing pillars supporting its roof, which is carried by 12 immense arches of reinforced concrete. These are the largest in the world, for they have a span of 282 ft. which is nearly 10 ft. more than that of the reinforced concrete arches of the airship station at Orly, near Paris, previously the greatest of their kind in the world. The arches at Orly are 184 ft. in height, and in this respect exceed those of the Grand Palace at Brussels, which have a height of 102 ft. The comparative lowness of the Belgian arches added to the difficulties of design and construction, however, for it led to proportionally increased horizontal thrusts on the foundation blocks.

These great arches were constructed in pairs, joined together by horizontal reinforced concrete girders that overhung at each end to the extent of nearly 20 ft. Each pair weighs about 3,000 tons, and as they are spaced nearly 40 ft. apart, each constructional unit had a width of 80 ft. A special cement that hardens rapidly was used in order to enable the work of erection to be completed as quickly as possible. The pumps that placed it in position worked at the rate of 460 cu. ft. an hour and concreted a length of 132 ft. of arch in a working day of eight hours; and the supporting centrepiece employed during the pouring of cement and the consequent setting was removed only 14 days after the work was completed.

The steel centrepiece itself was a remarkable engineering achievement. It consisted of four ribs joined in pairs, together forming an arch with a span of nearly 280 ft., and weighed 500 tons. It rested directly on specially prepared foundations while pouring was in progress, and on the completion of this operation was removed in one piece to the position required for the erection of the next pair of concrete arches.

The foundation blocks for the arches are carried on 29 piers and each block supports a load of 1,250 tons. Actually they are capable of carrying much greater loads and underwent severe tests during constructional work, when they had to withstand the strains imposed upon them by the addition of the weight of the centrepiece to that of the concrete structure itself.

The use of these gigantic arches for supporting the roof of the Central Hall provides a vast space nearly 160,000 sq. ft. in area that is absolutely free from supporting columns or any other obstructions. Conditions within the building will be ideal, whatever the weather be like, for the windows are double in order to give protection from changes in temperature, and are embedded in the reinforced concrete of the structure itself, which provides the whole of the necessary support. As our illustration of the interior of the Hall shows, the windows are vertical and thus are not liable to become covered with dust to obscure the light; and they are readily accessible on both sides for cleaning purposes.

The Central Hall is flanked by other magnificent structures, and in its splendid surroundings is very impressive in appearance. In common with the other buildings of the Grand Palace it is decorated with statuary by leading Belgian sculptors. Some of the figures are on top of the pylons of the main frontage of the Great Hall and all are carefully placed to fit into the rhythm of the structure and to harmonise with its light and shade. The four statues on the pylons in front of the Great Hall are 15 ft. in height and symbolise transport on land and sea, and in the air. Other groups are historical in character, and commemorate the significant years of 1830 and 1930, when Belgium first became a kingdom, and had been consolidated by the varied experiences of 100 years, respectively. In addition there is a kind of frieze comprising 12 statues that represent national activities of all kinds at the present day, and thus form a commentary on modern Belgium.

Winged Warriors of the Air

Interesting Members of the Hawk Family

By Eric Hardy, F.Z.S.

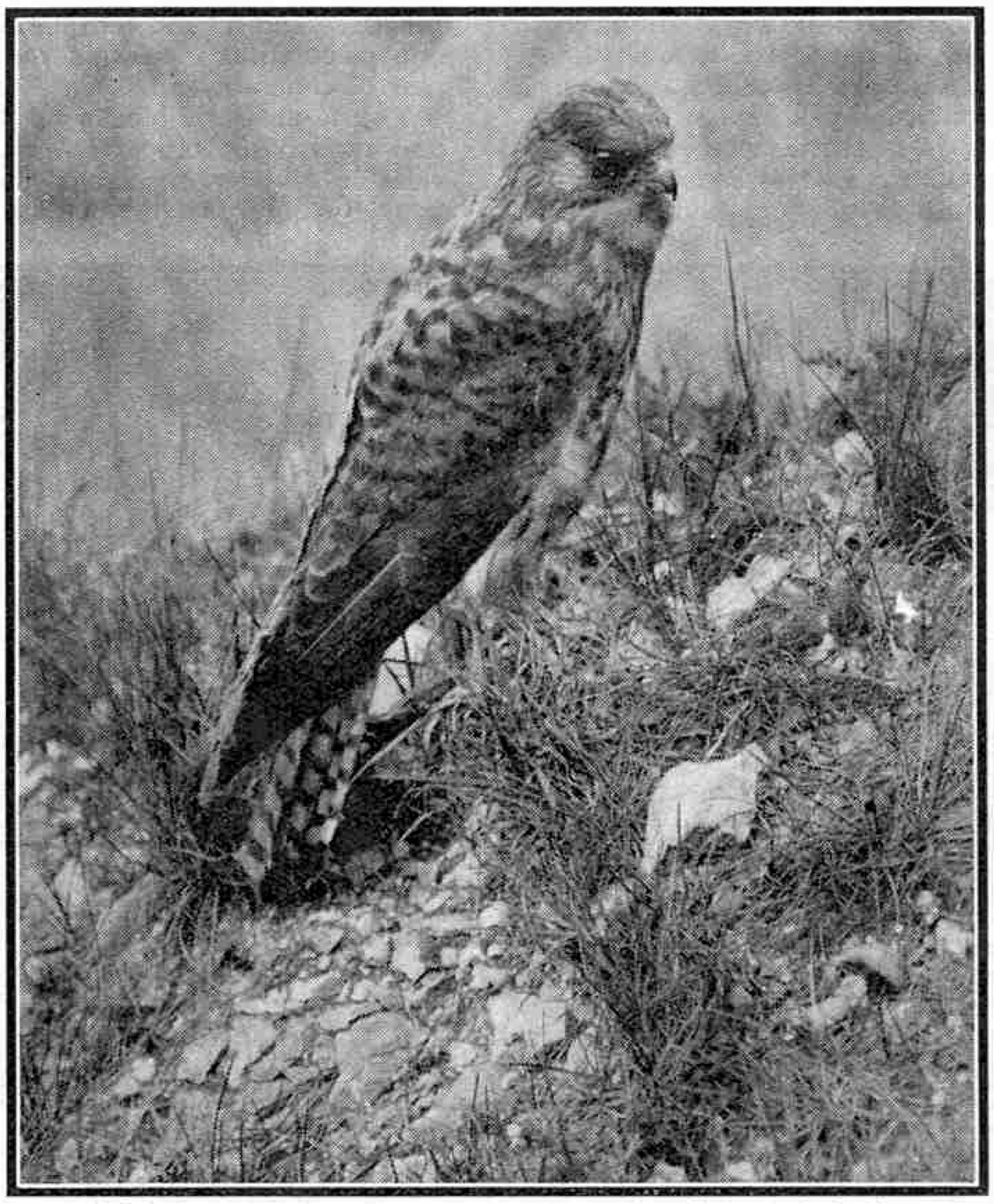
WHEN naturalists first wrote about birds, they placed the hawks and the other birds of prey at the head of their lists, because the noble and courageous appearance of these winged warriors of the air commanded their respect above all others. Hawking, or training birds of prey to fly after game, was a recognised sport before guns were invented, and the practice of placing the hawks at the head of the bird world continued until quite recent times. About 50 years ago naturalists decided that the thrushes should precede the hawks, and just over 20 years ago it was decided that the crows, because they were the most intelligent, should be at the head of the bird world.

All birds of prey, however, are not true hawks. The great tribe of feathered warriors, the Raptores or birds of prey, are divided into owls, eagles, ospreys, harriers, falcons, kites, buzzards and vultures; and the hawks are merely certain members of the falcon family. In the British Isles the best known hawks are the sparrow-hawk, the kestrel, the merlin, the peregrine; and, rarer, the hobby, the Greenland falcon, the Iceland falcon, the lesser kestrel and the red-footed falcon. Abroad the lanner and the saker are well-known hawks of the Near East and India, still much used among the native princes who carry on the ancient sport of hawking for winged game and gazelle.

Unlike the vultures, which are closely related, the hawks always have their heads feathered. It is a curious fact that though most birds have the male the more beautifully coloured, in the hawks it is the female or hen bird that is the larger, handsomer, stronger and bolder. Their eggs, unlike those of the owl, are very highly coloured. The owl lays a round white egg, whereas the eggs of merlins and kestrels are extremely handsome in their rich reddish-brown, which readily distinguishes them from the eggs of any other birds. Hawks rear one brood annually, and the young are usually covered with thick white down until they get their wing feathers, and they look most curious objects.

Hawks are found in nearly all parts of the world. They have come aboard ships in the middle of the Atlantic and the Pacific when migrating; and kestrels are often found resting in the rigging of North Sea trawlers in autumn during their passage from North Europe to Britain, or like the sparrow-hawks may be seen around our lighthouses, resting on their way from Britain to winter in France or Spain. When the Yorkshire naturalist, Henry Seebohm, visited Siberia, 50 years ago, he found at the mouth of the Petchora River, sparrow-hawks, hobbies, merlins and goshawks inside the Arctic circle.

If you want a thrill in the country, look for hawks. The commonest hawk to watch is the kestrel, a small hawk, 13 inches long, which readily attracts attention by hovering in mid-air, head to wind, poised upon quivering wings and outstretched tail, every now and then adjusting itself to regain balance. After remaining transfixed in the sky for about half a minute it drops a few feet lower, hovers again and then drops another six feet or so, and finally pounces down into the grass. Its sharp eyes have noted a field mouse or a vole feeding in the grass, and that is how it hunts its prey, for unlike most birds of prey the kestrel only occasionally kills small birds.



A fine picture of a Kestrel, the commonest member of the Hawk family.

Sometimes you will see the kestrel hawking for cockchafers and other beetles in the evening beside a wood, or for dragonflies over the stream; and when its chicks are in the nest it takes more lizards to feed them than any other British bird. You can watch the kestrel all over the Continent and in Asia and Africa, and in addition to frequenting the wooded hillsides and the plains, it may even be seen in city parks or flying over the suburbs. All hawks are fast fliers, and in the air they are usually noticed by their speed, their narrow sharp wings, and rather long narrow tails.

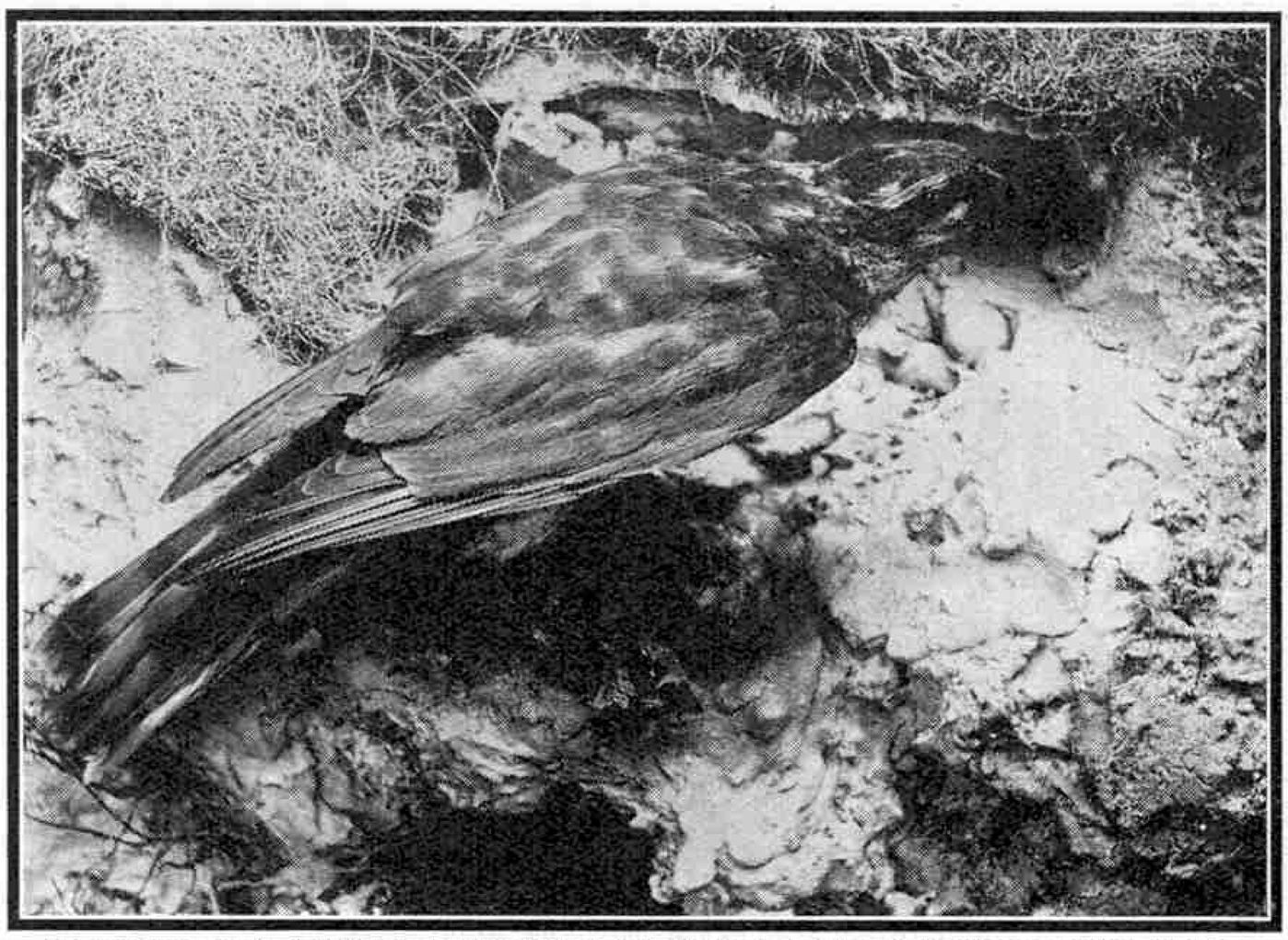
The nest of the kestrel is often found on a ledge of an old building or tower, or in a quarry or on a hillside, and sometimes in an old crow's nest or magpie's nest in a tree, for the kestrel builds no nest of its own. In April or May it lays from four to six reddish-brown eggs, blotched and marked with black and reddish-yellow, and after 27 or 28 days' sitting by the female kestrel, these hatch into white-downed chicks, which in from 30 to 33 days are able to fly. The underparts of the kestrel are tawny-rust colour, streaked longitudinally with black, not barred like the sparrow-hawk; its upper parts are chestnut-red and its legs yellow. The male is known from the female by the slate-blue colour of his head, rump and tail. An old kestrel is spotted instead of barred on the wing.

The kestrel is a good weather-vane in the country, for however slight the breeze you can always tell the direction of the wind by looking at a hovering kestrel. It always hovers head to wind, just as a ship berths prow to the current, to maintain balance and control. I have timed a kestrel to hover on the average from 10 to 30 seconds in the same spot, sometimes staying there as long as a full minute. Often in spring you can hear the cry of the kestrel, a shrill and ringing scream usually uttered when male and female are chasing each other about. When harvest time arrives, I often watch kestrels on the borders of fields that are being cut, for they come to catch the mice and voles disturbed from the shelter of the corn. The kestrel was not used by the hawkers, for it would only fly after bats and was too slow for game.

The sparrow-hawk, still a common sight in wooded country, was the hawk of the schoolboy of the Middle Ages. He used to fly it after small birds, and thus train himself in the art of hawking, so that when he grew up he would be able to fly his father's peregrine. A sparrow-hawk need never be confused with a kestrel. It is nearly 2 in. larger, its breast is barred, not streaked longitudinally, its wings are shorter and its legs longer; while its back and wings are dark grey, not chestnut, and the barred underparts are light buff. The sparrow-hawk does not hover, but usually sweeps along the hedgerows, ready to dart over and surprise a flock of finches or some feeding tomtits on the other side. The female, as big as a wood-pigeon, and the young sparrow-hawks, are browner on the head than the males, which are only as big as domestic pigeons. In spring you will find in a wood the sparrow-hawk's nest built of twigs and bark and often on the top of an old magpie's, crow's or wood-pigeon's nest, and containing four to six eggs, very different from the kestrel's, being bluish-white, blotched with chocolate brown and with

purple tinges. Like the kestrel it rears only one brood, taking 35 days to hatch its eggs.

The cry of the sparrow-hawk is a harsh screaming "mew," a cry the bird watcher can hear in all parts of Europe and across temperate Asia, including the Himalayas. The sparrow-hawk may be said to have learned the use of "free-wheeling" before bicycles were invented, for it darts through the air, then suddenly shoots along some distance with its short wings and long tail motionless, before it pounces on its prey across the hedge. It takes a lot of young birds, it must be admitted, but it eats large numbers of flying beetles, as well as moles, voles, mice and even slugs. It is to the woods that you must go in search of these hawks when they are nesting in summer, for they then rarely venture far from home, as they do in winter; and if you erect a "hide" in the trees opposite, when the bird is off the nest, and carefully camouflage it or harmonise it with its surroundings by leaves and twigs, you can watch a most interesting part of this hawk's life. When the young are growing up they must be taught to fly and earn their own living, so the mother hawk, who has fed them all along with the food brought her by her mate, flies over to an old nest near by and flattens it to form a dining table. Here the cock sparrow-hawk deposits his prey and the young hawks are taught to fly to their dining table for their meals. The marsh-harrier, another bird of prey, of the reeds in Broadland, has a similar "dining-table" device.



The Sparrow-hawk, a bird slightly larger than the Kestrel and often to be seen in wooded country.

In hawking days, the word "musket" was used for a male sparrow-hawk, the bird with which the adventurous schoolboy often caught his dinner, for small birds like wheatears, thrushes, sparrows and warblers were then regularly eaten. If you find a young sparrow-hawk in the nest in the wood, or fallen below, a common experience when the gamekeeper or farmer has shot the old hawk and failed to find the nest, you can take it home and make a wonderful pet of it. I found a young kestrel sufficiently tame to fly around the house free, and to come to one's finger when lifted. These young hawks are not at all vicious or bad tempered if properly treated.

Keep your young hawk in a spare room or stable, feeding it on sufficient meat or mice, and giving it a pan of water for drinking and bathing, for all hawks love a bath, just as do all owls. Tie two leather "jesses" to the hawk's ankles, with a short streamer or two hanging, so that you can catch hold of the bird without hurting its feet; and keep a strong leather gauntlet glove for carrying it. In its room or "mews" erect a perch for it, in the form of a round crossbar on trestles about four or five feet high. When feeding the hawk throw the meat on to the ground before the perch, so that it will learn to fly down at it. If it is very young you may have to give it sopped food in its mouth for a while. The bird will soon come to recognise you. Do not let anyone else handle it, and if you want to take it out into the country to fly it, tie to its feet two little bells such as children wear on their toy reins, so that you will hear it in the trees or grass. Do not fly it at birds in the close season between March and September, nor at birds on the scheduled list for protection by law. Any farmer will welcome you catching sparrows around his rickyard. There is a hawking club at Eton College, where many of the boys have their own hawks that they have trained from nestlings.

Female Gosnawk, ready for release after her prey.

Have you ever watched a kawk kill its prey? Contrary to popular opinion, you will see that it does not strike with its beak but with its legs. Only as a *coup-de-grâce* is the hooked bill used. Nature gave the hawk a hooked bill to tear the flesh when eating, and not for killing. If you found a hawk caught by its wing in one of those cruel and now illegal pole-traps, it would not peck at you, but, hissing with rage, would turn on its back and lash out with its feet. An owl would do just the same. It is not often that a hawk eats its prey where it killed it. Usually it first tears off the bird's head—probably to make sure that it is dead--then flies off to a favourite tree-perch and removes the wings and the feathers with its beak, holding the dead bird down with one foot. A hawk carries its prey in its foot, and an owl usually does the same; but it may change it to its beak when it lands by the nest and moves on to the nest.

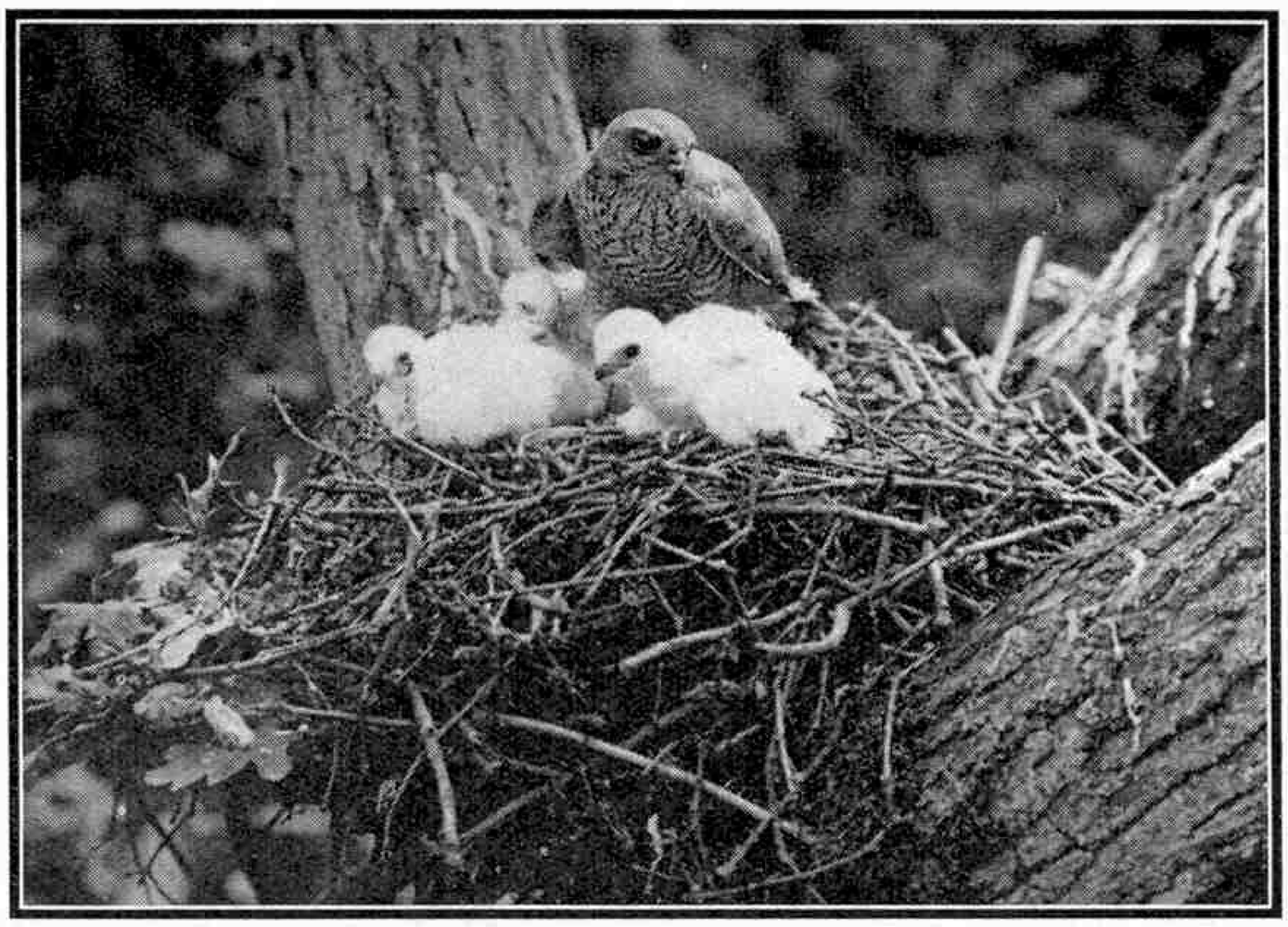
A much scarcer British hawk in the wild is the goshawk—a corrupton of "goose-hawk"—though this handsome bird is widely used by hawkers of the British Falconry Club, which came into being seven years ago when the old Hawking Club ceased to exist. Most goshawks now used in England are obtained from the Black Forest of Germany, where they nest freely. Goshawks last nested in Britain in Scotland at the beginning of the present century. The goshawk is a woodland bird, still nesting in Northern Europe and Northern Asia, and its four eggs are white, strongly tinged with sea-green. Once it nested freely in England, when woods were denser and more numerous.

On the wing, the goshawk looks much like a big sparrow-hawk, and hawkers fly it after hares, rabbits, rats and pheasants. Unlike the peregrine falcon, the goshawk cannot be flown after flying prey. It sweeps along the ground after the bolted rabbit, confuses it with its expanded wings as it strikes it, and all is over within two seconds of the "gos" being "cast" or released by the hawker. A trained goshawk I knew killed her first rabbit within a fortnight of her arrival from Germany, and before her first birthday. A young goshawk has its breast marked with longitudinal streaks, but the adult bird has the marks crosswise. The feathers of the full-grown goshawk are mostly varying shades of brown, the tail being barred with brown and tipped with white, the feathers on the back of the neck faintly spotted with white.

Probably the boldest and fastest bird in Britain is the peregrine falcon, the hawk of the sea-cliffs of Wales, Scotland, Ireland and Cornwall. It is like a big sparrow-hawk with dark blue-grey back and wings and barred breast, but it is as much as 18 inches long, and is further characterised by the handsome black moustachois on its white cheeks. The speed of the swooping peregrine has been estimated to exceed 200 m.p.h., and it flashes past one on the cliff-head like a bolt from the blue as it ricochets after the puffin, or jackdaw, or rock-pigeon, or

twite, following every movement of its prey, and in the end striking it in a cloud of feathers.

The hawkers use the peregrine more than any other bird, flying it most at partridge, rooks and wild duck; but it is very rare for a peregrine to strike game like rabbits, for such is the speed of its flight that it would injure itself in striking the ground after the swoop. In spring, when the birds are thinking of nesting, the haunts of the peregrine ring with the shrill screams of the "tiercel" or male bird, as he circles high overhead or out to sea, or comes sweeping in to perch on his favourite rock. When the three or four tawny-pink and orange-red eggs hatch on the cliff ledge, the male collects the food and gives it to the brooding female. But he seldom brings it right to the nest, and if you watch the birds you may be lucky to see the "pass." The tiercel comes flying through the air, and as soon as his mate hears his shrill screams she is off the nest, and rising up into the air, flies to meet him. When he is flying directly over her, he drops the bird he has caught and killed, and his mate catches it in her talons as it falls. She often turns a somersault in doing so. Such a "pass" may also be seen with the harriers over the Broads, and occasionally with sparrow-hawks.



Female Sparrow-hawk with her three white downy chicks.

Just as the fox is said not to touch the prey around its den for fear its work may disclose its home, so the peregrine does not kill the birds nesting near its nest, and even the ravens buffet it and chase it away, for the ravens start nesting much earlier than the hawks. Sometimes you will find peregrines inland where there are cliffs for them to nest among, as in Derbyshire and Scotland.

The hobby is seldom found in Britain except in the Home Counties and the South, though it nests across Europe and temperate Asia. In looks it resembles a small peregrine a foot in length but with a vertically streaked breast, the female hobby being two inches longer. Unlike our other hawks, save the honey buzzard, the hobby is a summer migrant to this country, visiting us only to nest and leaving again for North Africa and the Mediterranean for the winter. It usually nests in the old home of a crow or magpie, laying two or four eggs, much like the kestrel's, only lighter. The chief food of the hobby consists of dragonflies. In the Middle Ages, when the hobby was much commoner in Europe, it was a favourite hawk of the schoolboy, and just as the little merlin was called the "Lady's Hawk," so the hobby was called the "Young Man's Hawk," and the Elizabethan schoolboy called the male hobby he had trained for hawking a "Robin." He usually flew it at swallows and martins, for on the wing it was little less fast than the peregrine. Fast birds always have long pointed wings, and the wings of the hobby reach beyond its tail. On the wing it looks like a big swift that can turn and twist in the air after every effort of the swallow to escape it. It frequents the well-wooded districts, and its call is much like the "pee--ee--ee" cry of the wryneck.

Another and closer view of a Sparrow-hawk.

The smallest of all our hawks is the little merlin, or "Blue Hawk" of the moors of the Old World from Iceland east to Eastern Siberia, though it is scarcer in Asia than in Europe. In Britain it is commoner in the North and in Wales than in the South. In the days of falconry this little bird, not quite a foot long, was usually used by the ladies for their hawking, for it was easily trained, and they flew it after larks. The merlin is like a smaller kestrel, but the male merlin has bluish-grey upper parts. Unlike most hawks, the merlin usually builds its scant nest on the ground on the moors, rearing its young on a bed of the heather twigs. Its four eggs are a deeper red than the kestrel's, and its scream more shrill, while from the habit of its youngsters of frequently perching on a favourite stone or rock, the young merlin is called the "Stone-Falcon." Like all the hawks, it rears but one family, the mother bird doing the rearing, the male being the hunter of the food. Often when the female is shot the brood perishes because the male, though still collecting food, does not know how to feed the family!

There are far more hawks in North America than in Britain, but the American pigeon-hawk is hardly different from our merlin of the moors, and the American cooper's hawk and the duck hawk are but little different from the peregrine of British cliffs. The goshawk, so rare in Britain, is fairly numerous in north and eastern North America, wintering as far south as Virginia; while the marsh-hawk or harrier, which in Britain is confined to the Norfolk Broads and a few other haunts like the north Lancashire mosses, is a frequent sight in America, ranging as far south as Panama and Cuba in winter. American Boy Scout naturalists have a very good method of learning to identify their hawks. Most hawks fly high and are usually seen from below, so in his field note-book the American Scout draws a series of silhouettes or black outlines of what the various hawks look like with wings and tail open, for colours are indistinguishable at such heights. Thus they can name the kind of hawk hovering or circling in the air above by the length or shortness of its tail, if it is broad or forked, if the wings are wide or narrow, or if there is a white patch on the rump, as in the marsh-hawk. The latter, like the cooper's, short-shinned and American sparrow-hawks, are recognised too by their long tails, while the duck-hawk and the pigeon-hawk have short tails and the red-tailed hawk has a fan-shaped tail in flight.

Africa also has many more hawks than Britain, and those known as whistling hawks, related to our goshawks, utter a mellow, piping whistle more tuneful than any other hawk note. They were originally named "chanting goshawks" when naturalists first found them. The strangest of these is the black whistling hawk, with a black plumage but strikingly contrasting brilliant red eyes, legs and base of the beak. In Brazil and the Falkland Islands the caracara hawks are specially adapted to feeding on the big lizards and reptiles and so they have long, naked scaly legs, impervious to the bites (not stings) of their reptile prey. In South America the caracara hawks were said by the Argentine naturalist Hudson to hunt in packs like dogs or wolves, for unlike most hawks they seldom fly, but run about very swiftly and nest on the ground.

Sinking Deep Wells in the North Downs

II.—Intercepting a Natural Watercourse

By W. Coles Finch, M.Inst.C.E.

LAST month I described how underground streams are formed, and how they collect the rainfall and secretly pour it into the rivers. In this article I shall describe briefly the manner in which these streams are intercepted and utilised to supply towns and cities with water.

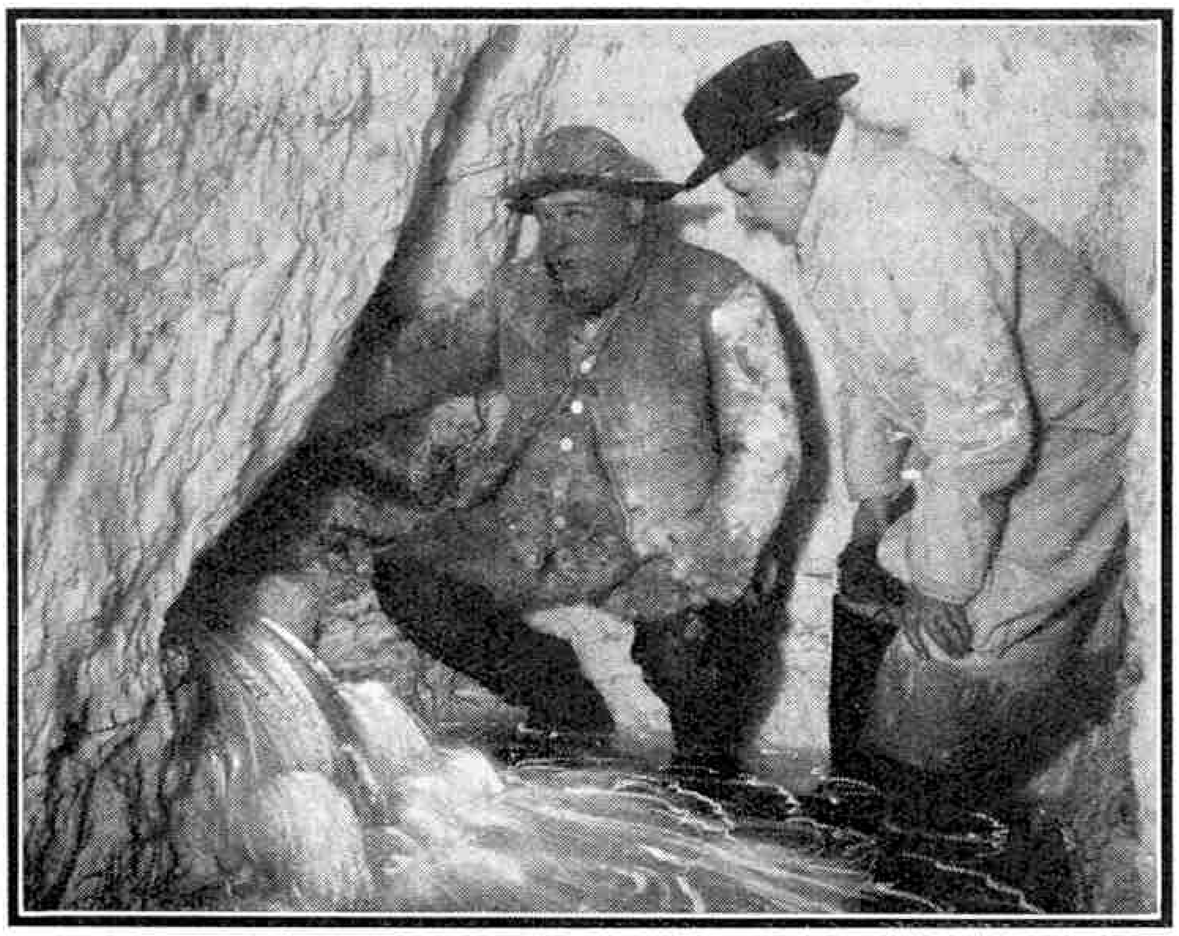
I will assume that the site for sinking a well has been chosen. It will of course be where there is every probability of tapping a considerable amount of free water passing to the sea. The next step is the erection of a strong structure of iron or timber, called a gantry, and near this a steam winch for the purpose of hauling up the buckets of excavated material. The sinking of the well is carried out by pick and shovel until water is reached, when a different method of attack has to be adopted. It is usual at this stage to line the well with brickwork, as it is probable that there are faulty places in the stratum where large masses of rock might break away, with disastrous consequences to the men working below.

When the bricking of the well is completed sinking is resumed, but this time by a method known as percussion boring. A heavy drilling tool resembling a huge chisel is attached to one end of a long cable and lowered into the well, and the other end of the cable is secured to the drum of the steam winch. The cable is wound in sufficiently to raise the tool a few feet, and is then released, causing the tool to strike a powerful blow at the bottom of the well. The workmen raise and lower the tool repeatedly, automatically turning it a little before each drop; and by pounding the stratum beneath it into a thick paste called "slurry," the tool gradually cuts or bores a clean and cylindrical hole. Percussion boring is continued until the well has been sunk to a depth of about 120 ft. below the "line of saturation," that is the level where water was first encountered.

The workmen then set about the arduous task of enlarging the boring to the full diameter of the well. Powerful temporary pumps suspended from the top of the well are used to draw off the slurry. At first they are operated slowly, but their speed is soon increased to an extent sufficient to enable them to keep the water below the point where the men are at work.

At this stage the experience of the water engineer is needed. Suitably attired and provided with a light, he is lowered slowly down the well. From the moment he passes below the line of saturation he carefully examines the side of the well, and notes the character of the rock, its density, the presence or absence of fissures, seams, or cavities, or other indications of a promising level at which to commence cutting an adit to intercept the free water passing to the sea. As he gets lower down the well he will probably encounter spurting jets of water under considerable pressure, and although they may almost swamp him, he will welcome them as an indication of the level he is seeking to determine.

The water engineer's task is a very responsible one, as upon his decision rests the future success of the enterprise, in which probably many thousands of pounds are involved. It is possible to commence tunnelling at too low a level, in the compact dense rock where little or no water is passing; or too high, in which case the principal body of water may remain untapped below. As a rule the lower chalk is too compact to offer a good water supply, and the ideal level is where the upper chalk is below the line of saturation, or is at the top of the middle chalk. The ideal conditions are not always present, however.

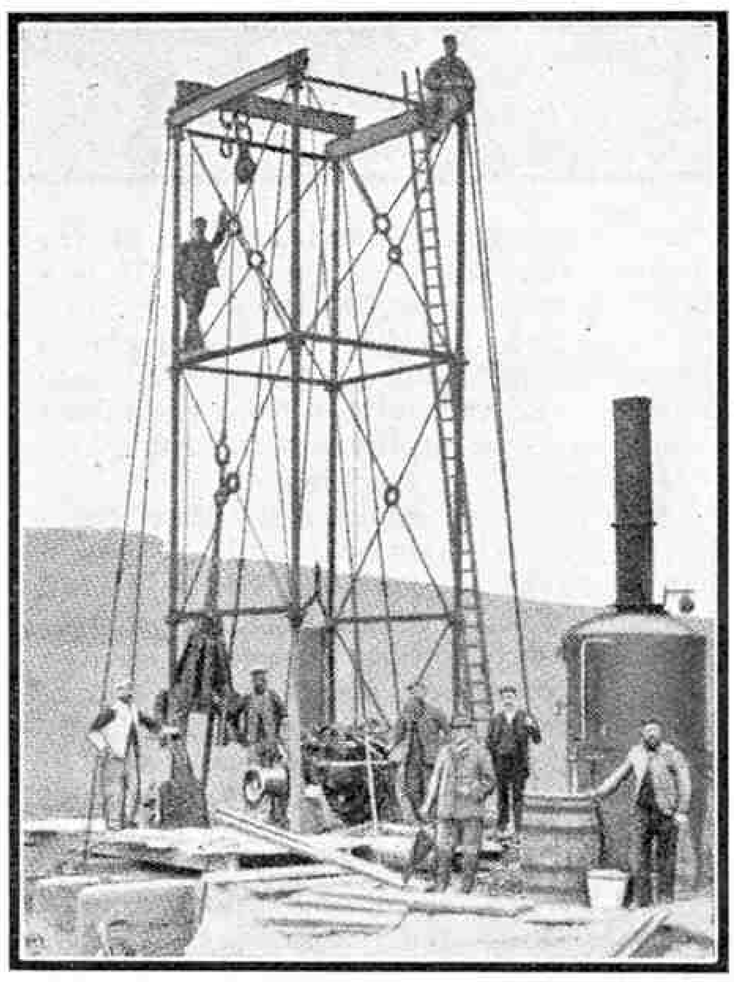


Inspecting an underground fissure from which water is pouring into a natural watercourse. Mr. Coles Finch is on the right.

When the water engineer returns to the surface he states at what depth and in which direction the adit must be driven. At the depth he has decided upon baulks of timber are built into the side of the well and a false bottom of stout planking is fixed to provide a platform for the workmen, and tunnelling is then begun. As soon as a short length of adit has been driven a narrow gauge track is laid along it, and is extended as the work proceeds. The excavated chalk is loaded into huge buckets mounted upon trolleys, and these are pushed along the track to the shaft of the well, where the buckets are drawn up to the surface by the steam winch mentioned earlier in this article.

In my own experience as a water engineer I have on two consecutive occasions in two different localities intercepted a watercourse yielding 1,250,000 gallons per day, at a point only about 30 yards along the adit. There is always the probability of having to tunnel several hundreds of feet in this search for water, however, and therefore the adits must be large and airy.

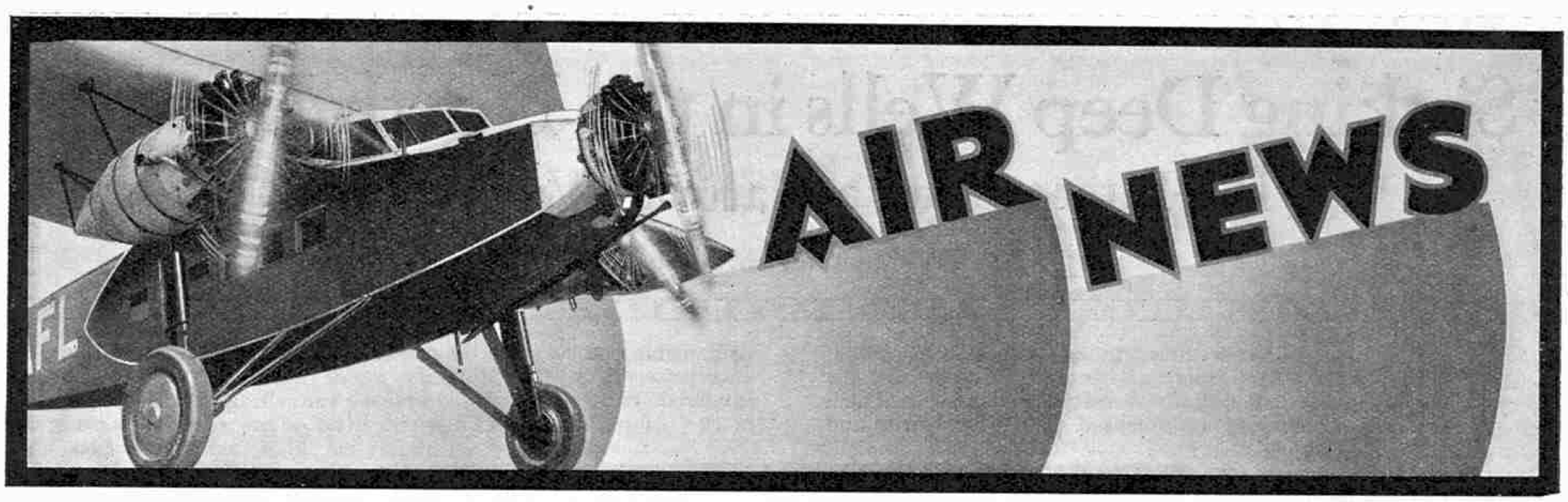
While these operations are going on the pumps labour incessantly to keep the water below the adit level. If success is not achieved within, say, 200 ft. of the well shaft, the air becomes exhausted, lights will not burn in it and it will not support life, and an air pump has to be brought into use. It has always interested me to observe the gradual dimming of the lights in a new and long adit, and to note how they increase in brightness immediately the air pump is started. The element of danger is always present, however, for this delving deeply into the earth for water is risky though fascinating work, and many lives have been lost in carrying out such operations.



The author and his men boring with a 60-inch chisel.

When at last the adit intercepts a natural watercourse along which water is flowing in considerable volume, tunnelling operations are stopped. Frequently the workmen return to the well shaft and commence cutting a second adit, but in another direction. Thus the work continues until sufficient adits, or "feeders," have been cut to yield the desired quantity of water.

In the next article I shall deal with Artesian borings, which penetrate the chalk and its underlying thick bed of gault clay, piercing the water-bearing sand beds some 600 or 700 feet below the surface, when the released water rises unaided almost to the surface and sometimes high above it.



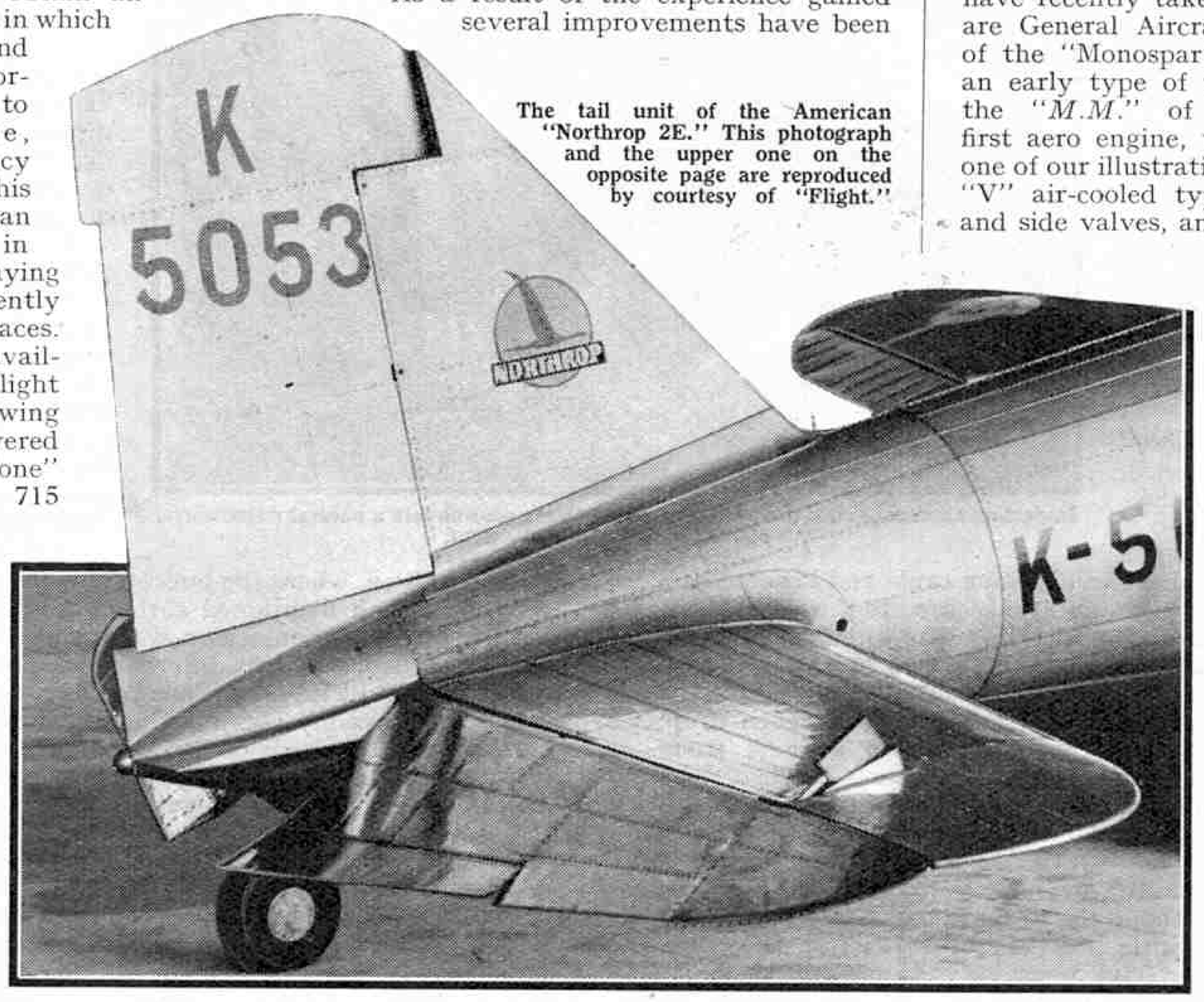
Air Ministry Test American "*Northrop 2E*"

The technical researches of the Air Ministry are conducted along many different lines, and include the study of outstanding types of foreign aircraft. For this purpose the Ministry obtain an example of the machine in which they are interested, and subject it to very thorough tests in regard to engine performance, strength, and efficiency when in flight. In this manner the American "*Northrop 2E*" shown in two of the accompanying illustrations has recently been put through its paces.

The details so far available show that it is a light bomber of the low wing monoplane type, powered by a Wright "Cyclone" engine that develops 715 h.p. at 7,000 ft. at 1,930 r.p.m. The engine is of the nine-cylinder air-cooled radial type and is enclosed in a cowling. The wings are built up of channel section spars to which "Alclad" wing covering is riveted, and the whole is stiffened by stringers fixed between the spars. The tail unit is constructed on similar lines to the wings.

There are three machine gun positions, one in the rear cockpit and one in each wing, the latter guns firing forward through apertures in the leading edge of the wings. The guns mounted in the wings are placed so that they are outside the area swept by the propeller, and when they are not in use their muzzles are concealed by neat cover plates. A particularly interesting feature is the bombing arrangement, the deadly load being carried outside the machine, on massive hooks under the wing centre section. To enable the bomber to see his target a retractable nacelle with a window facing forward is built into the floor of the rear cockpit.

The weight with full load is 7,500 lb., and the maximum speed is 226 m.p.h. When carrying 1,100 lb. of bombs and cruising at a speed of 165 m.p.h. the machine has a range of 1,500 miles. It has a span of 48 ft. and a length of 28 ft. 10 in.



The tail unit of the American "Northrop 2E." This photograph and the upper one on the opposite page are reproduced by courtesy of "Flight."

Short "Scion" Improvements

The Short "Scion" twin-engined light transport aeroplane, which made its first appearance last year, has been thoroughly tried out in actual service. As a result of the experience gained several improvements have been made, and an improved version of the machine has now been produced. It is a high wing monoplane, like the first "Scion," but the engine nacelles have been placed sufficiently high up to fair neatly into the wing, and the outlook from the pilot's cockpit has been improved by modifications to the nose of the machine.

The "Scion" is produced by Short Bros. (Rochester and Bedford) Ltd. It has a span of 42 ft., a length of 31 ft. 6 in. and a height, with the tail lowered, of 8 ft. The two 90 h.p. Pobjoy "Niagara" engines give it a maximum speed of 128 m.p.h. They are mounted in line with the leading edge of the wing, one on each side of the fuselage. The cabin is roomy and has seating accommodation for five passengers, who enter it through a door in the port side. Storage for baggage is provided at the back of the cabin and under the seats.

G.A.L. "V/4" Engine

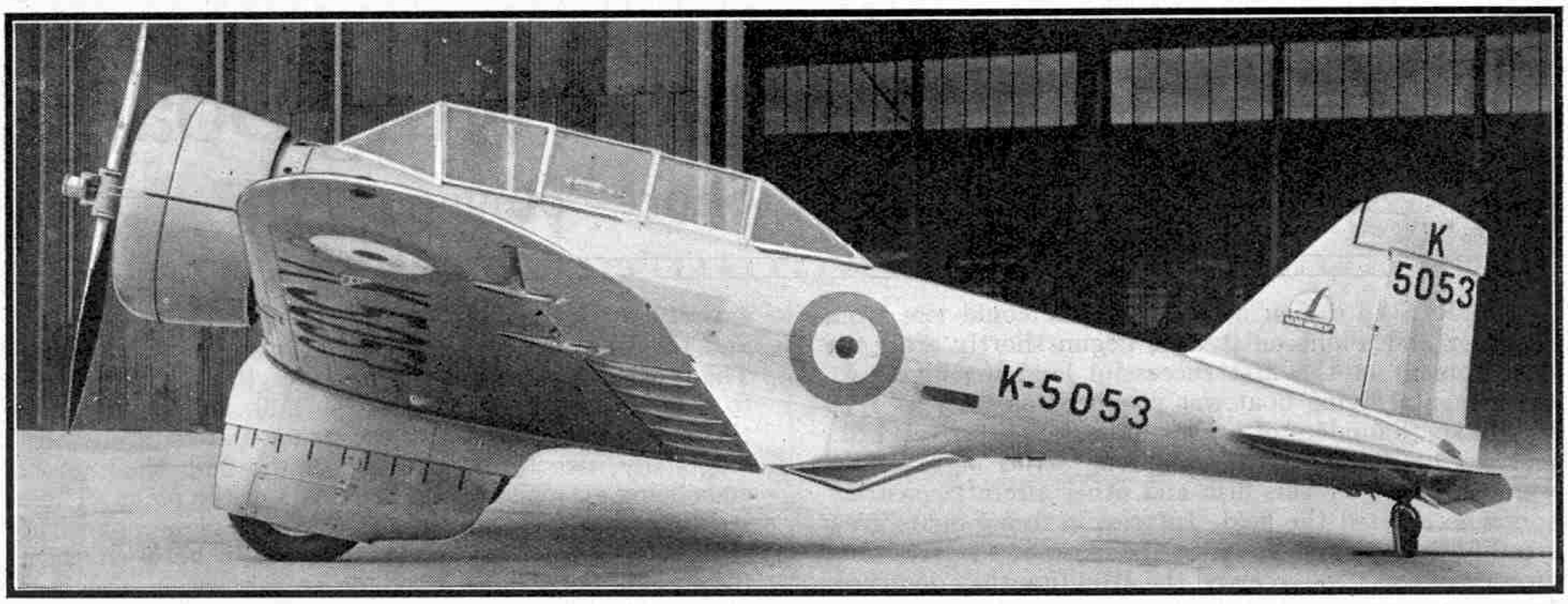
Many aircraft firms who hitherto have constructed only machines are now turning their attention to the design and manufacture of aero engines. Among those who have recently taken this enterprising step are General Aircraft Ltd., the producers of the "Monospar" low wing monoplane, an early type of which was described in the "*M.M.*" of January 1933. Their first aero engine, the "V/4," is shown in one of our illustrations. It is of the inverted "V" air-cooled type, with four cylinders and side valves, and develops a maximum of 100 b.h.p. at 2,000 r.p.m.

The idea of an engine of this type was conceived by Mr. H. G. Stieger, the Managing Director of the company and the inventor of the "Monospar" system of wing construction. The cylinder heads are of light alloy and the valve chambers are of aluminium bronze. The inlet valves are much larger than the exhaust valves, and both have double springs and are operated through adjustable tappets by a single camshaft running through the base of the crankcase. Lubrication is supplied by two gear type oil pumps and, as our illustration shows, there are no external oil pipes. Provision is made for the fitting of two oil pumps and an electrical generator and electric starter so that a light aeroplane equipped with this engine can be started by pushing a button on the dashboard, just like a motor car.

The "V/4" is being incorporated in the 1935 models of the Monospar ST.10 and ST.11.

The King to Review R.A.F.

An important feature of the elaborate celebrations to mark the 25th year of the King's reign will be his review of the Royal Air Force, of which he is Chief. The review will be held at Mildenhall and Duxford on 6th July, the Saturday after the annual R.A.F. display at Hendon. This will be the King's first important review of the R.A.F.



700 Vacancies in the R.A.F.

The Air Ministry announce that on 1st August next there will be about 500 vacancies in the Royal Air Force for well-educated boys to be trained as aircraft apprentices in the trades of fitter, wireless operator, mechanic and instrument maker. Applicants must be between the ages of 15 and 17 years on the above date. No previous trade experience is necessary, but they will have to sit for an entrance examination that will be conducted at numerous local centres early in June. If the applicant possesses an approved First School Certificate with specified credits he may be excused this examination. The latest day for the receipt of nominations is Tuesday next, the 7th May.

A new scheme for boy entrants also is announced, which will open the way for boys whose educational qualifications are not quite up to the standard required for aircraft apprentices to enter the R.A.F. Under this scheme about 200 boy entrants will be required in September next. Candidates sitting for the aircraft apprentices' examination, but for whom there are no apprenticeships available, may, if of suitable age and education, be offered free enlistment as boy entrants. The 200 boys enrolled will be sent to an R.A.F. Training Establishment for about a year, and will be trained in the trades of armourer, photographer and wireless operator. The course will not be the equivalent of the comprehensive three years' course for aircraft apprentices, but it will be complete, and the boys will be trained to a high standard of practical skill.

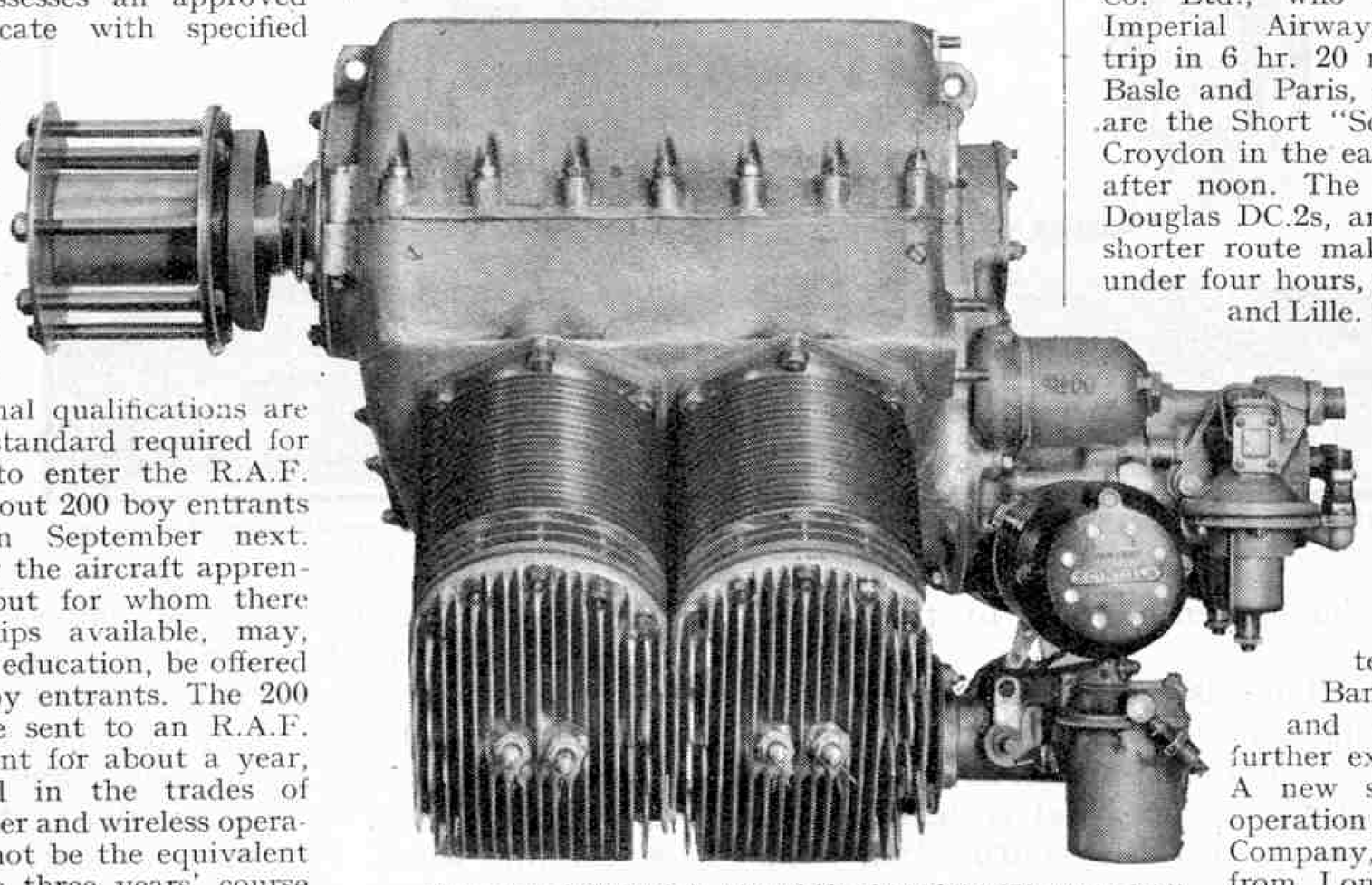
Photographic Record of 29,000-Mile Flight

The American Geological Society have been enriched by the gift of 600 photographs taken during a recent remarkable world flight of 29,000 miles. The photographs were taken by Dr. U. Light who, with a companion, made the trip in a Bellanca seaplane. Many countries were visited, including Labrador, Greenland, Holland, Germany, Italy, Iraq, India, Java and the Philippines. From the Philippines they went by steamer to Vancouver, where they resumed their flight and visited Mexico and Cuba before returning to New York.

K.L.M. Progress

Last year the Royal Dutch Air Lines, more familiarly known as the "K.L.M.," carried 85,969 passengers, an increase of 44,262 over the previous year. This is a striking proof of the rapid growth of passenger transport by air on the Continent. The mail traffic carried on the company's services last year was 25 per cent. greater than during 1933, and totalled 507,000 lb., while freight transport reached the high figure of 2,385,070 lb.

Commencing this month Douglas six-seater machines are to be used on the company's Batavia service, and they will enable the present schedule time of 7½ days to be reduced by two days.



The upper photograph is a broadside view of the "Northrop 2E." The bomber's nacelle is shown retracted, on the underside of the fuselage. The lower photograph is of the G.A.L. "V/4" engine, and is reproduced by courtesy of General Aircraft Ltd.

New Qantas Air Liners Named

The six D.H.86 express air liners now in use on the Singapore-Brisbane section of the England-Australia Empire Service have been named after the Australian cities of Canberra, Brisbane, Sydney, Melbourne and Adelaide. The Singapore-Brisbane service is operated by Qantas Empire Airways. A full description of the machines was given in the "*M.M.*" of December last.

Continental Summer Air Services

The summer timetables of Imperial Airways and some of the European air lines disclose many instances of faster and extended services, an indication that the companies concerned anticipate a continuance of the remarkable growth of Continental air travel that was an outstanding feature of last year's passenger traffic by air.

There are now two daily services between London and Zurich, run by Imperial Airways and Swiss Air Traffic Co. Ltd., who are co-operating. The Imperial Airways service makes the trip in 6 hr. 20 min., including stops at Basle and Paris, and the machines used are the Short "Scylla" type. They leave Croydon in the early morning and shortly after noon. The Swiss service employs Douglas DC.2s, and by following a much shorter route makes the journey in just under four hours, including stops at Basle and Lille. They depart from Zurich in the early morning and afternoon, and the former run gets the passengers to London in time for them to connect with the Railway Air Services lines to Liverpool, Belfast and Glasgow.

Air France have extended their weekly Bangkok service to Hanoi and are contemplating a further extension to Hong Kong. A new service, worked in co-operation with the Spanish Air Company, transports passengers from London to Madrid in just over five hours. Another important development made possible by co-operation is a Scandinavian service operated in conjunction with Sabena, by which passengers from London reach Copenhagen in time to connect with air services from there to Stockholm, Gothenburg and Oslo.

King's Cup Air Race

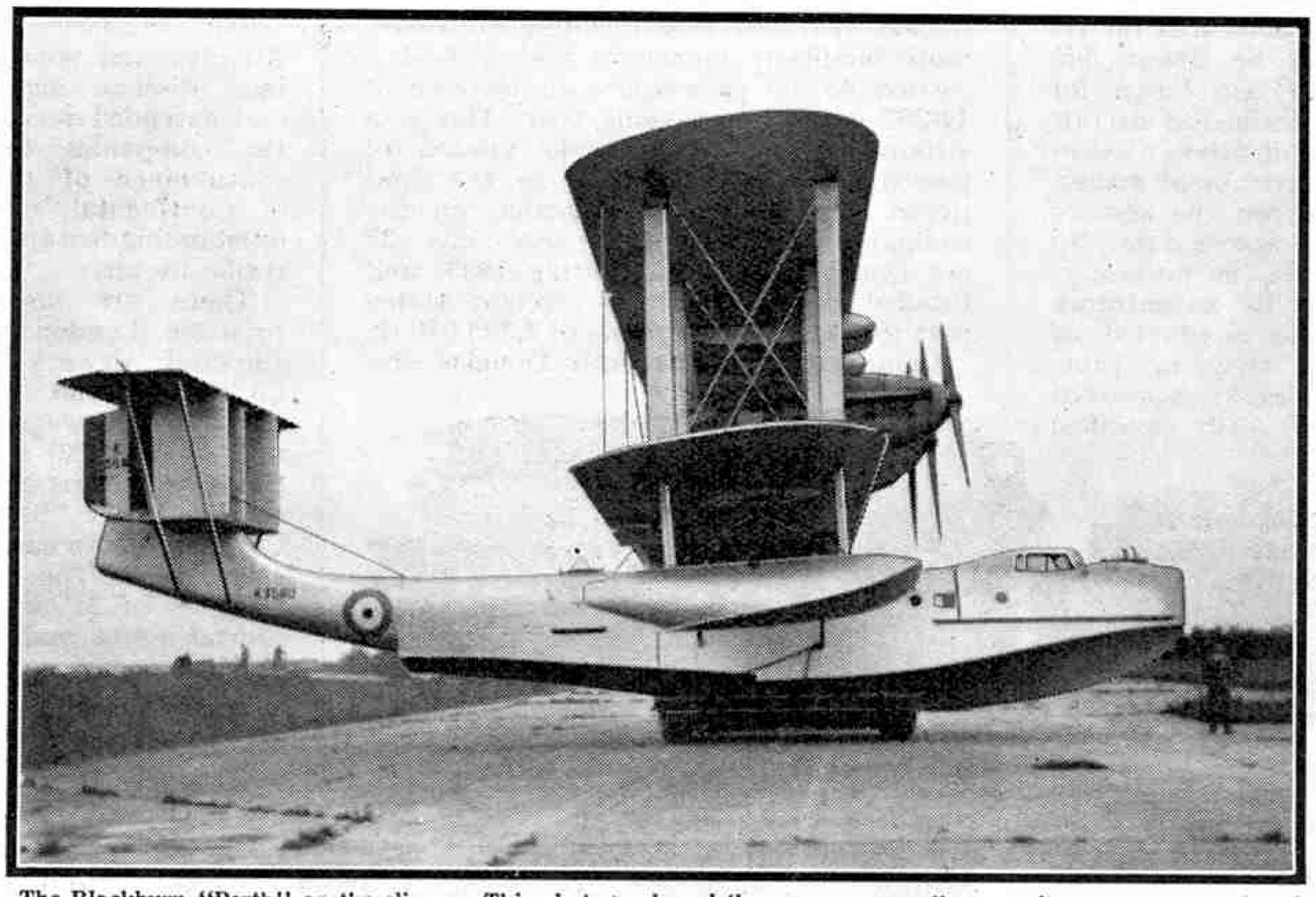
One of the most popular annual air events in this country is the King's Cup Air Race, which this year will be held on 6th and 7th September. The route chosen covers Great Britain and Northern Ireland, and for the first time will necessitate competitors flying over the sea.

Two British Military Flying Boats

Blackburn "Perth" and Short "Singapore III"

EFFORTS to design aeroplanes that could rise from water and alight on it were begun shortly after the development of the first successful land machines. An experimental flying boat was produced as early as 1909 by Messrs. Saunders of Cowes, now Saunders-Roe Ltd., and during the War period a long series of machines were produced by this firm and other aircraft constructors who entered the field. Interest in flying boats grew steadily, but it was not until the close of the War that aircraft of this type received the attention they deserved. In recent years wonderful advances have been made in their design, and it is satisfactory to know that British designers and constructors of flying boats have produced machines that are among the safest and most efficient of their type in the world.

Flying boats are distinguished from seaplanes by the presence of a hull, seaplanes being provided with floats only. They may be classed roughly as military and civil, and in this article we shall describe two interesting military types, both of which have been adopted by the Royal Air Force.



The Blackburn "Perth" on the slipway. This photograph and the upper one on the opposite page are reproduced by courtesy of the Blackburn Aeroplane and Motor Co. Ltd.

The first of these machines is the Blackburn "Perth," a three-engined reconnaissance and coastal patrol flying boat produced by the Blackburn Aeroplane and Motor Co. Ltd. It is of the biplane type, and is designed on similar lines to the well-known Blackburn "Iris," the first of which was built in 1926. During the ensuing six years improved types of this machine were produced, and we described and illustrated one of them, the "Iris III," in the "*M.M.*" of May 1931. Owing to its large fuel capacity, the "Perth" is capable of patrolling a great extent of coastline, and it has a very long range when employed for independent scouting and bombing purposes. It is suitable also for use in co-operation with surface craft as an escort for transports or merchant ships over long distances, and for scouting or observation duties with the Fleet.

The machine has an overall length of 70 ft. and an overall height of 26 ft. 5½ in. The massive main planes are of 97 ft. span, and the top plane is staggered slightly forward of the lower one. They are constructed almost entirely of duralumin. The spars are of box structure and the ribs are of special section tubular girder work. The bottom plane is attached by its centre section to a mounting on the top of the hull, and is braced in this position by four steel tube struts that slant outward diagonally, two from each side of the hull, their upper ends being attached to the underside of the plane. These struts and those supporting the top plane, and the streamline wires that extend diagonally between them to provide interplane bracing, are shown in the rear view of the "Perth" on this page. Balanced ailerons are fitted to both planes.

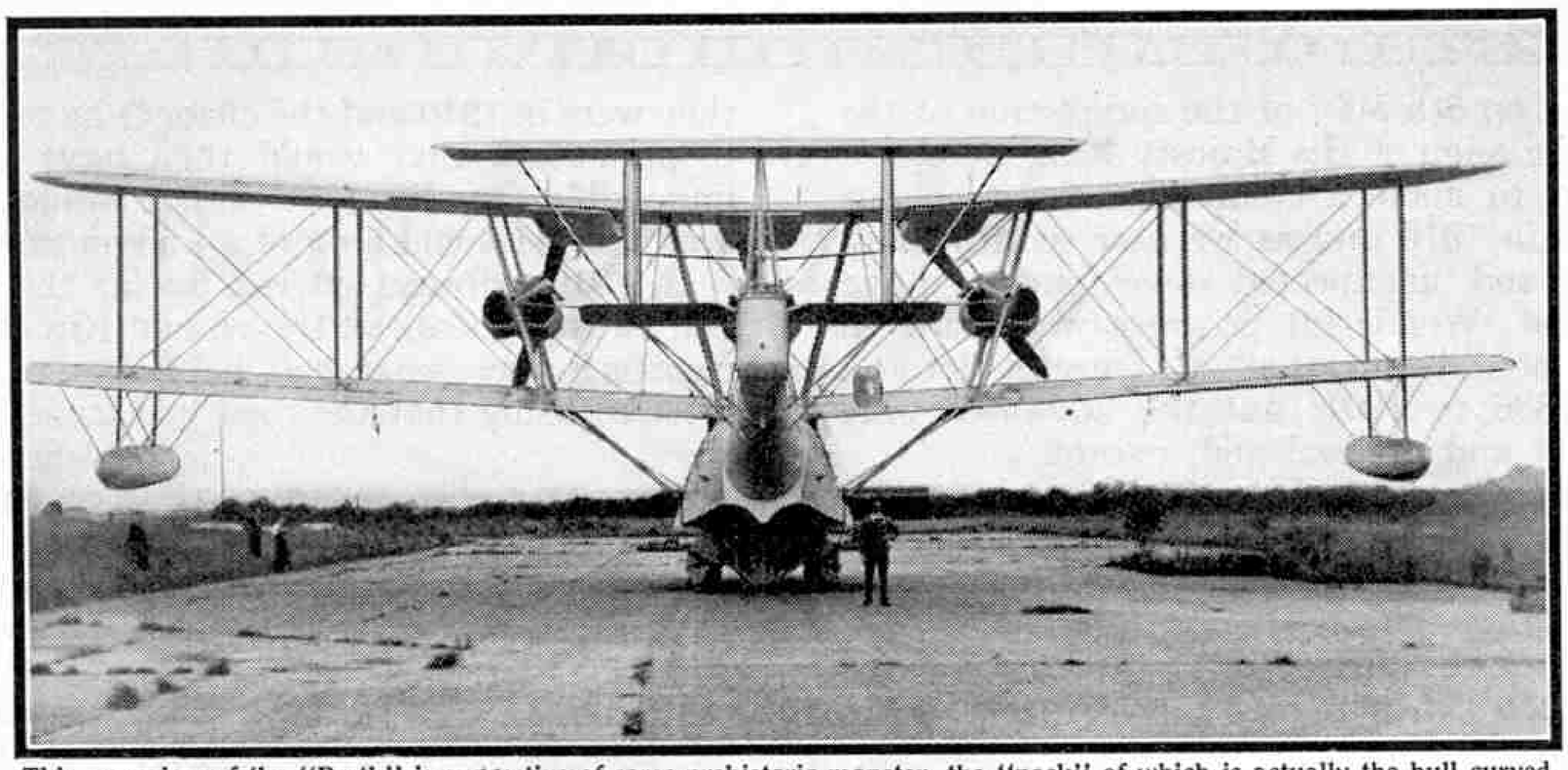
The hull is constructed throughout of "Alclad," with the exception of the stainless steel fittings securing the bottom main and tail planes in position. It is built up of transverse frames of full section attached to a centre keelson that extends the full length of the hull, and additional rigidity has been obtained by attaching all constructional members direct to the shell.

The tail unit consists of a biplane structure comprising top and bottom tail planes and elevators, two fins and three rudders, the top tail plane and elevator being of greater span than the bottom. The tail planes and elevators are of similar construction to the main planes, and are braced in the two bays formed by the two fins and centre rudder by streamline wires. Two pairs of steel tubular struts run from the bottom tail plane at the outer fin joints to support the top tail plane extensions. Servo control, which may be engaged or disengaged by means of a clutch, is incorporated in all three rudders. The top elevator is the control elevator, and the bottom elevators are used solely for trimming purposes.

The "Perth" is equipped with three Rolls-Royce "Buzzard II M.S." engines, which give 825 h.p. each at 2,000 r.p.m. at sea level. They are housed in duralumin nacelles mounted in the gap between the planes. Each nacelle contains also the cooling and oil systems for its engine, and has a hinged bonnet cowling one panel of which can be folded down to form a platform providing easy access to the engine, so that adjustments can be made.

Fuel is carried in three petrol tanks each of 575 gallons

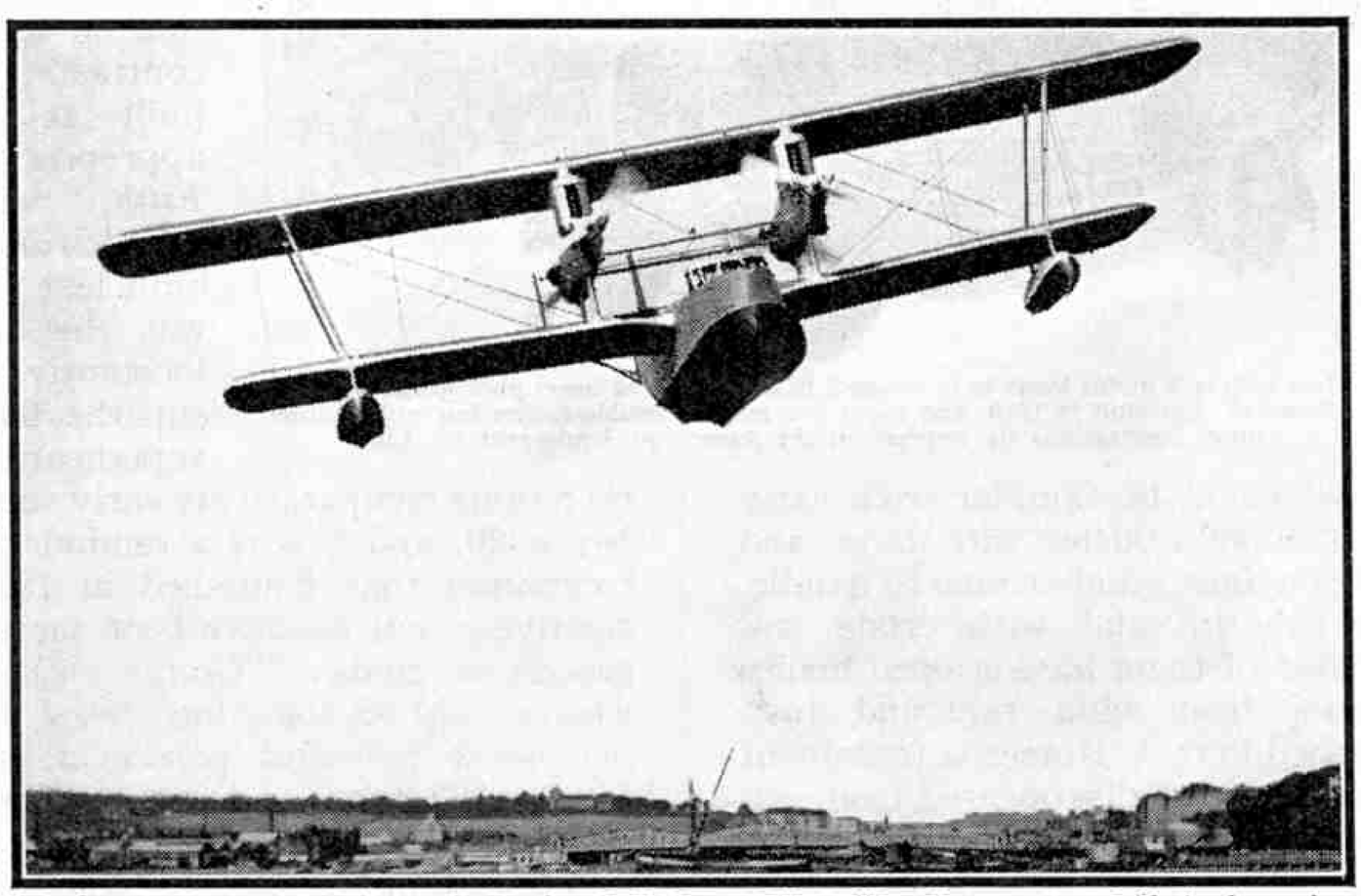
capacity, situated one above each engine and attached to the underside of the top plane. The petrol gravitates from the tanks to a distributor placed centrally outside the hull, and from this to the engines; and the system is so arranged that each tank can feed any one, two or all three engines. An important feature of this petrol system is that no fuel cocks or piping are carried inside the hull, and therefore the risk of fire is very remote.



This rear view of the "Perth" is suggestive of some prehistoric monster, the "neck" of which is actually the hull curved upward to the stern and the tail unit.

Accommodation is provided in the hull for a crew of five, consisting of a pilot, a navigator who also acts as a gunner or second pilot, a wireless operator, an engineer gunner and an additional gunner. The interior arrangements are interesting. There is a gunner's cockpit in the nose of the machine, just in front of the pilot's cockpit. It has provision for an automatic quick-firing gun, and for a standard Lewis gun on a sliding mounting that can be brought forward when the former weapon is not in use. The pilot's cockpit is equipped with two seats side by side, and dual flying and engine throttle controls. It is totally enclosed, but has a sliding roof in two sections.

Next comes the navigator's station, the floor of which is on a slightly lower level. Towards the back of this compartment are two side ports, with hinged panels that can be opened so that compass bearings may be taken. The officers' and men's quarters and the wireless cabin are to the rear of the navigator's station, as also is the engineer's station, which is equipped with oil and water thermometers, oil pressure gauges, etc. Farther aft is the rear gunner's cockpit, with provision for a gun mounting and a machine gun. Entry into the hull is made through the gun ring, a ladder being provided down to a central gangway that extends throughout the length of the hull.



The Short "Singapore III" in the air. The four Rolls-Royce "Kestrel" engines are mounted in tandem pairs. This illustration is published by courtesy of Short Bros. (Rochester and Bedford) Ltd.

The "Perth" has a net weight of 20,927 lb. and an all-up weight of 32,500 lb. At sea level it can attain a maximum speed of 115 knots, and at a cruising speed of 95 knots it has a maximum range of 1,300 to 1,496 sea miles. The rate of climb at sea level is 800 ft. per min., and an altitude of 10,000 ft. can be reached in 22 min. The service ceiling is 11,500 ft.

The other type of flying boat shown in the accompanying photographs is the "*Singapore III*," produced by Short Brothers (Rochester and Bedford) Ltd. This machine is a development of the "*Singapore II*," which was described and illustrated in the "*M.M.*" of May 1931, and differs from it chiefly in having the internal equipment completely redesigned to bring it into line with modern requirements.

The "*Singapore III*" is a biplane flying boat with planes of the usual "Short" type and unequal in span, the top wing being of 90 ft. span and the bottom one of 76 ft. Both planes are equipped with ailerons. The hull is well faired in order to keep down the spray, and has two steps, from the second of which the lines sweep upward to the stern. It is of all-metal construction, the frames being built to the shape of the hull, to which the skin, suitably stiffened, is attached. Wing tip floats are slung from the underside and near to the tips of the bottom plane, and an adjustable tail unit of the monoplane type, consisting of triple fins and rudders, is mounted on the rear end of the hull.

The four Rolls-Royce "Kestrel" engines are rated at approximately 560 b.h.p. at 2,350 r.p.m. at 2,000 ft. They are mounted in tandem pairs in the gap between the wings, and each pair is carried in a duralumin nacelle supported by single front and rear interplane struts. The two front engines are "Kestrel III M.S." and those at the rear are "Kestrel II M.S." A useful feature is the provision of engine slinging gear so that the engines can be changed while the machine is afloat.

There are three gunners' cockpits, one in the nose of the machine, one amidships and the third at the extreme aft end of the hull, behind the tail unit. The pilot's compartment is enclosed and is equipped with side-by-side seating and full dual control. Aft of the pilot space is a compartment used as officers' quarters, and the engineer, wireless operator and crew are accommodated farther to the rear. At a cruising speed of 105 m.p.h. the machine has a range of 1,000 miles.

His Majesty's Silver Jubilee

The World in 1910 and Now

THE celebration on 6th May of the completion of the 25th year of the reign of His Majesty King George V naturally leads us to make a comparison between our country as it was in 1910 and as we now see it. Many startling changes and unexpected developments have marked this period. Wonderful progress was made in previous reigns, notably in that of Queen Victoria, extending from 1836 to 1901; but the advances were comparatively slow and gradual and, except for the introduction of steel and iron and the coming of steam power and railways, they led almost imperceptibly to changes in our daily lives. The changes effected in the 25 years of the present reign have been far more drastic, and indeed almost revolutionary. A Rip Van Winkle who fell asleep in 1910 and awoke to-day would find himself living in an entirely new world.

Suppose we imagine such an individual to be suddenly brought into the streets of London after his long sleep. With his memories of old days he would look round for horses, hansom cabs, and tramcars with uncovered upper decks and hard wooden seats. Horse buses were not extinct when he fell asleep, for the last in service in London did not cease until 1911; and he would be familiar with early types of motor buses, clumsy vehicles with large and comparatively unreliable engines, cumbersome to handle, and uncomfortable to ride in; and with crude and unreliable motor cars, most of them having open bodies that gave little protection from wind, rain and dust. The scene to-day is utterly different. Horses, a prominent feature for centuries, have almost disappeared from our streets, and this alone would be sufficient to mark an entirely new era. The vehicles they hauled have been replaced by motor vehicles of all kinds, from vans and gigantic lorries to saloon cars in which we travel swiftly in complete comfort. In practically all large towns there are handsome and spacious electric tramcars with upholstered seats and covered upper decks, and everywhere, even on our once almost deserted country roads, are to be seen reliable and well-equipped motor coaches and buses, maintaining services with the regularity of express trains. Our roads and streets are far busier than they were in 1910 and the changes have speeded up traffic to an extent that would then have been regarded as impossible. Our Rip Van Winkle would now find crossing a city street something of an adventure!

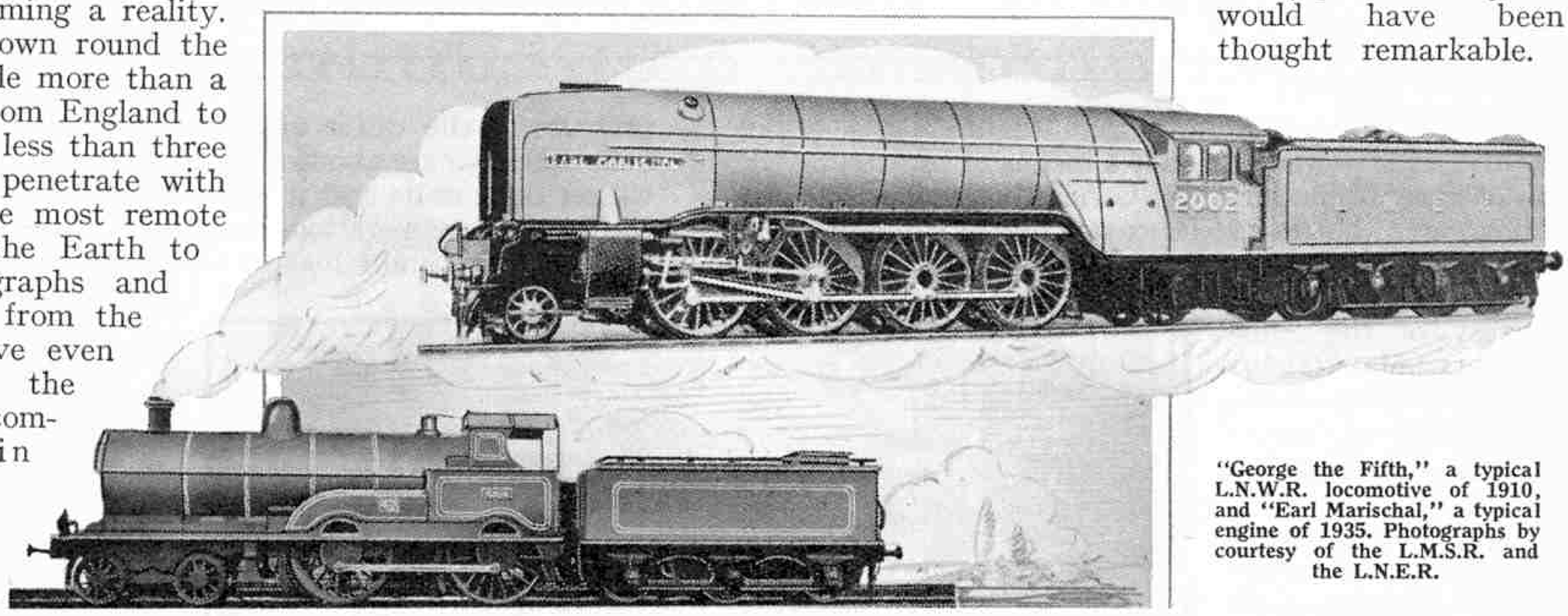
In 1910 railways offered by far the most convenient and swiftest means of travel, and Rip naturally would be curious to see what had happened to them, especially after realising that the road had come into its own once more. Entering a great railway station would give him another surprise, however, for he would find that the revolution on the road had not been accompanied by any decay on the steel highway, but actually had served as a stimulus to the production of more powerful locomotives, and rolling stock that offers the greatest comfort to passengers and provides them with facilities of all kinds.

How London's motor buses have changed in 25 years. The lower photograph shows a "General" bus built in 1910, and above is a modern double-decker bus with central door. Photographs by courtesy of the Associated Equipment Co. Ltd.

Locomotive progress is well illustrated by the upper illustration on the opposite page, which contrasts an L.N.W.R. engine built at Crewe in 1910, and appropriately named *"George The Fifth,"* with the giant 2–8–2 *"Earl Marischal"* of the L.N.E.R., built last year. *"George the Fifth"* was the first L.N.W.R. express locomotive to be provided with a superheater, the application of superheating in this country being then in its comparatively early stages. It is now L.M.S.R. No. 5320, and this is a reminder that the independent companies that flourished in 1910, with all their distinctive practices, have been merged into the four great groups of to-day. *"George the Fifth"* with its tender weighs only 99 tons, but *"Earl Marischal,"* the largest and most powerful passenger engine in the country, weighs 167 tons, and its massive sleekness of form is characteristic of modern ideas in locomotive design.

Astonishing as these changes would appear to our modern Rip Van Winkle, their effect would be small in comparison with that produced by a trip to Croydon Aerodrome. There he would realise that during the last 25 years Man has really achieved the conquest of the air. He would remember that in 1910 a few daring men had propelled themselves into the air on frail machines that seemed to be made of string and chips of wood, and were provided with inadequate petrol engines. Now he would see giant liners rising easily and gracefully into the air on

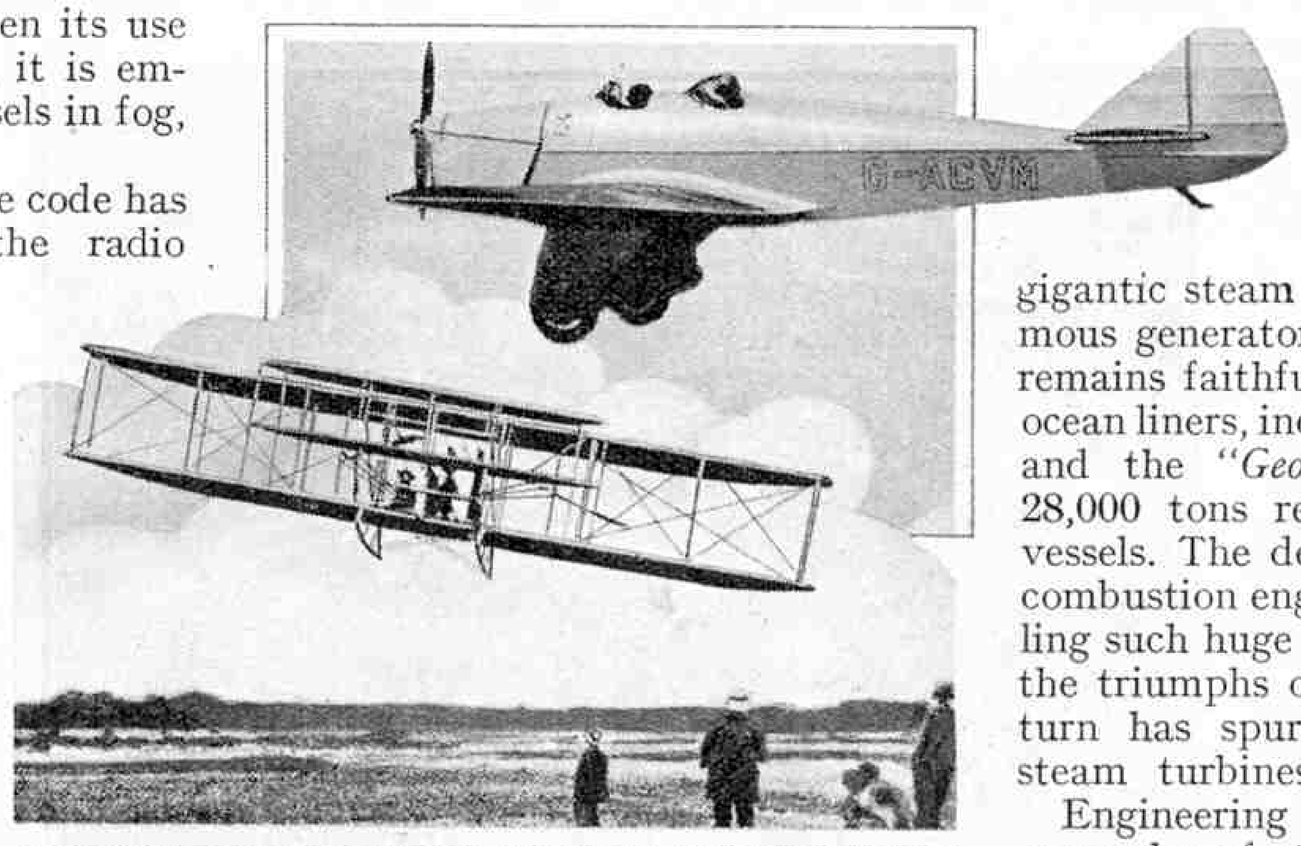
their way to destinations on the Continent that can be reached in a few hours, or to South Africa, India and even Australia, countries thousands of miles away that are now within a few days of our shores. In 1910 the Air Age was still a dream, for there were few people with sufficient vision to foresee the wonderful future awaiting the aeroplane. Now it is rapidly becoming a reality. Men have flown round the world in little more than a week, and from England to Australia in less than three days. They penetrate with ease into the most remote regions of the Earth to take photographs and make maps from the air, and have even flown over the Poles, accomplishing in comparative comfort and in a few hours journeys that as recently as 1912 cost men and dogs many months of almost incredible privation and hardship, and in some cases their lives.



"George the Fifth," a typical L.N.W.R. locomotive of 1910, and "Earl Marischal," a typical engine of 1935. Photographs by courtesy of the L.M.S.R. and the L.N.E.R.

At Croydon there would be evidence of another modern miracle in the great radio beacon. Radio of course was not unknown in 1910, but was still in its infancy. It was already installed in many ships, however, and in the previous year the entire world had been thrilled by the story of the heroism of the radio operator of the S.S. "*Republic*," which had been rammed and sunk by another vessel. The operator sent out a radio call for help, remaining at his post until the very last moment, and other ships rushed to the rescue, with the result that the crew and passengers of the "*Republic*" were saved. This was the first occasion on which the new means of communication proved its value for saving life at sea. Since then its use has become universal, and it is employed also for guiding vessels in fog, and for directing aircraft.

Radio telegraphy in Morse code has been supplemented by the radio telephone, and to-day the entire Earth is covered with a network of high-powered radio stations that bring the remotest parts of the Earth into telegraphic and telephonic communication with each other. Long and costly cables, laid down with infinite trouble, are not required, for the radio beams travel through the ether with the speed of light. By means of broadcasting, radio also brings the world into our homes, enables millions to hear words spoken on great occasions in almost any corner of the Earth, and provides us with entertainment on a scale that in 1910 would have been regarded as absurdly impossible. The miracle of radio broadcasting is one of the greatest achievements of science and engineering during the present reign.



A Wright aeroplane of 25 years ago. Above it is a Miles "Hawk Major," our photograph being reproduced by courtesy of "The Aeroplane."

When we turn to engineering we find no developments that are quite as startling as the advent of radio broadcasting or the achievement of the conquest of the air, but progress has been steady and continuous, and has changed the aspect of the civilised world to a degree that in any previous 25 years would have been thought remarkable.

For instance, in 1910 the "*Mauretania*" was the last word in shipbuilding. Her 80,000 s.h.p. steam turbine engines gave her a speed of 26 knots, and she was indeed an ocean greyhound, for she held the "Blue Riband" of the Atlantic from 1907 until 1929, when it was wrested from her by the "*Bremen*." Throughout her career she was the most popular vessel on the Atlantic, and the announcement that she was to be withdrawn from service and broken up was received with world-wide regret. To-day attention is concentrated on the recently-completed "*Normandie*," and on the "*Queen Mary*" now being fitted out on Clydeside, where she was launched last year. It is confidently anticipated that the "*Queen Mary*" will regain the Blue Riband for this country.

In the meantime rivals have threatened the supremacy of steam, for the internal combustion engine and the electric motor have gone to sea. The "*Normandie*" in fact is an electrically-driven vessel, her gigantic steam turbines driving enormous generators. The "*Queen Mary*" remains faithful to steam, but many ocean liners, including the "*Britannic*" and the "*Georgic*," of 27,000 and 28,000 tons respectively, are motor vessels. The development of internal combustion engines capable of propelling such huge ships as these is one of the triumphs of the engineer, and in turn has spurred the advocates of steam turbines to greater efforts.

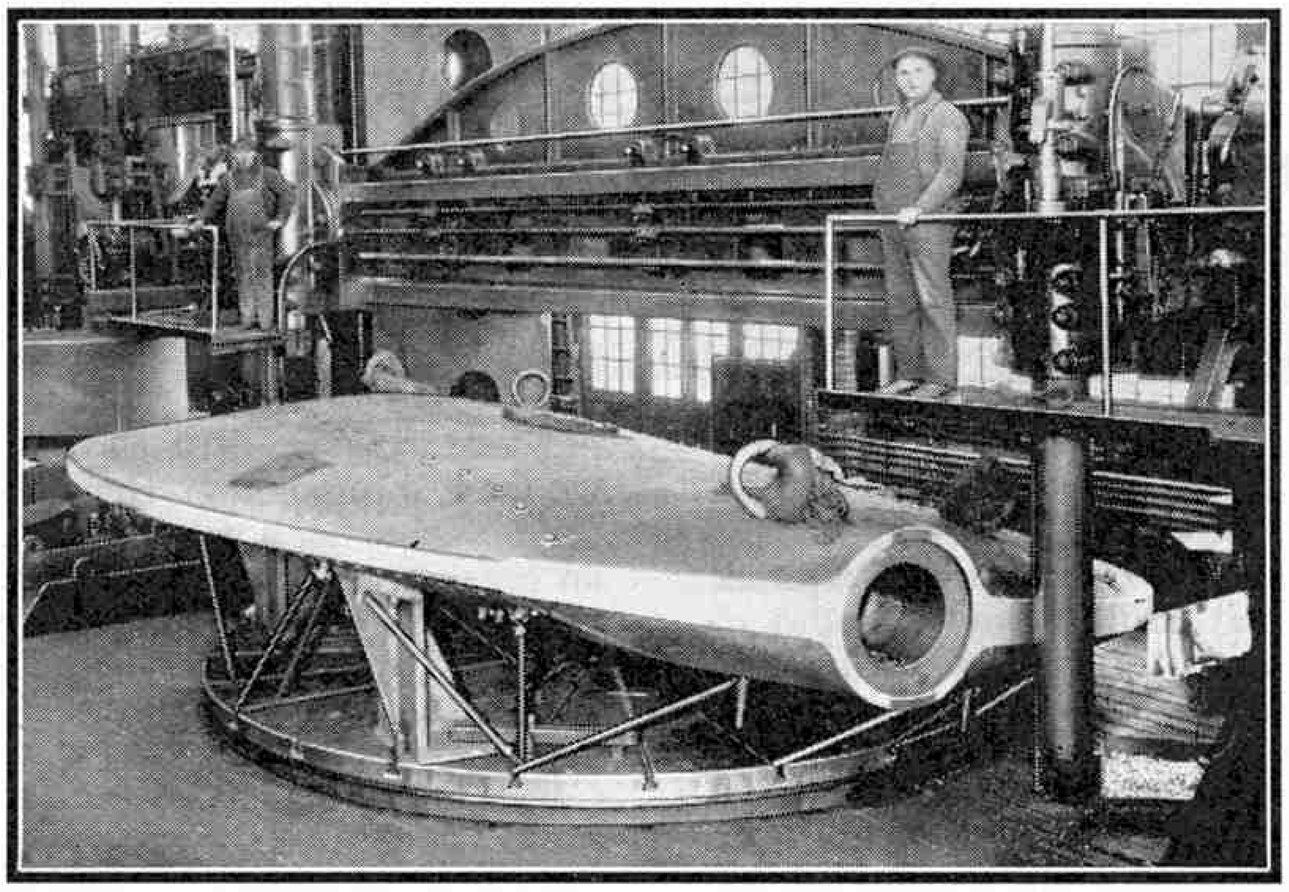
Engineering furnishes many other examples of steady progress and development, notably in bridge building. Among the wonderful structures of this kind completed in recent years are the great arch bridge across Sydney Harbour; the Zambesi River Bridge, the longest over-water bridge in the world; and the Washington Bridge across the Hudson River at New York, which has a suspended span of 3,500 ft.

Giant Valves at Niagara Power Station

Controls for 70,000 h.p. Hydraulic Turbines

ONE of the most important requirements of an hydraulic power station is a means of controlling the flow of water to the turbines. Generally this is effected by sliding gates, but in special cases control is obtained by means of large valves. Our cover illustration this month, which is reproduced by courtesy of the Allis-Chalmers Manufacturing Co., U.S.A., shows the housing of one of three giant butterfly control valves that form part of the equipment of the hydraulic station of the Niagara Falls Power Co. Each of the three valves weighs 98 tons and has a diameter of 23½ ft.

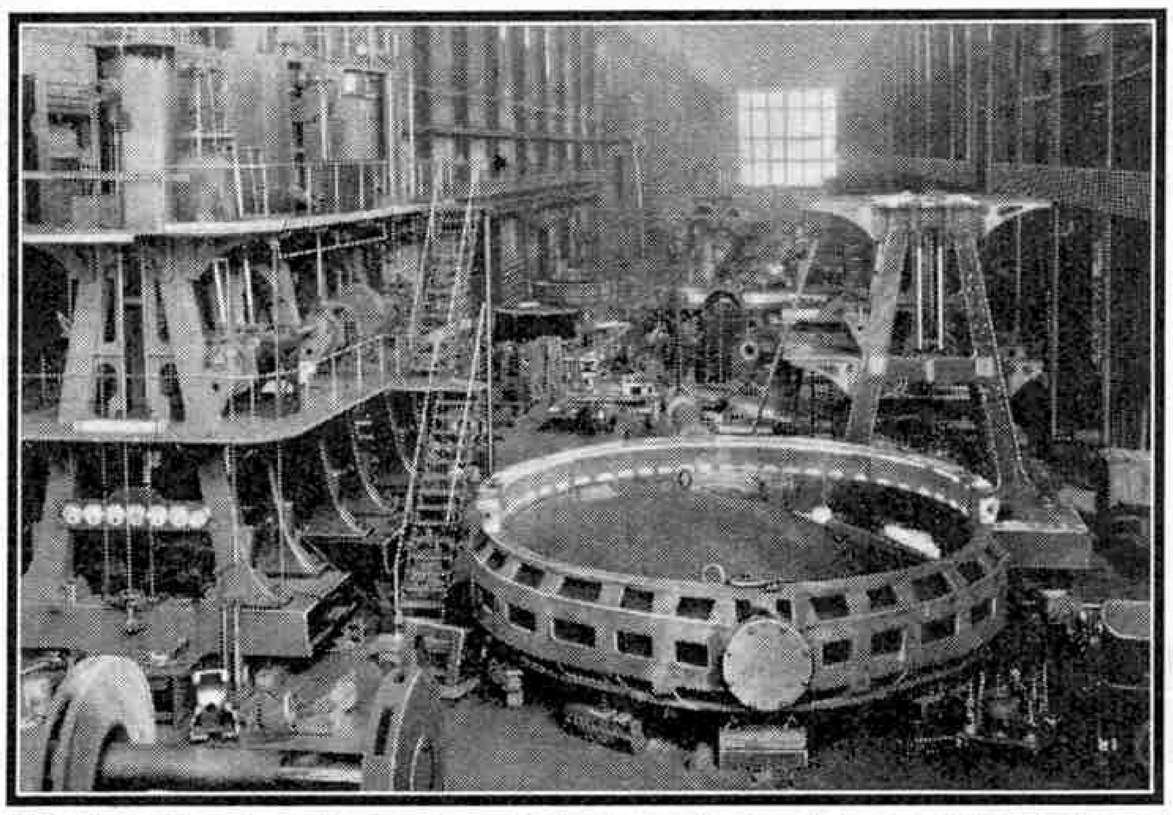
The valves are situated at the upper end of the penstocks through which passes the water that feeds the three 70,000 h.p. hydraulic turbines, and they take the place of the usual sliding head gates. They are designed so that they can be opened against the full pressure of the water, and they can be closed with full velocity against a pressure of 50 ft. head of water on the centre of the valve. The ordinary type of head gate generally used in hydraulic plants is quite unsuitable for operating under these conditions. The pivot on which the 23½ ft. diameter wicket of each valve is carried is vertical, and in its closed position is designed to withstand a total force of 1,250,000 lb., which is taken on two 19 in. diameter trunnions. Owing to their huge size it was impossible to cast and transport the valves in one piece, and therefore the housing was made in six sections and the wicket in three sections. The centre section of the wicket is 36 in. thick.



The wicket of a 23½ ft. diameter butterfly valve being machined on a boring machine. Three of these giant valves control the penstocks at the hydraulic station of the Niagara Falls Power Co.

The valves are operated by hydraulic cylinders situated 50 ft. above them, which move the valves with 150 lb. oil pressure, the pressure being transmitted to the valve wickets through a 24 in. diameter hollow shaft.

The designers of the valves estimated that the great pressure of the water under working conditions would deflect the wicket about ½ in., and in order to render the wicket tight in its seat it was purposely deflected during the machining operations to approximately the shape it would assume under load. The upper illustration on this page shows the wicket of one of the valves being machined, and in the lower illustration the housing, wicket and operating shaft are shown completely assembled, in the works of the Allis-Chalmers Manufacturing Co.



This illustration shows the housing, wicket and operating shaft for one of the giant valves completely assembled. The photographs on this page are reproduced by courtesy of the Allis-Chalmers Manufacturing Co., U.S.A.

The Niagara Falls power stations form one of the largest and finest hydro-electric power systems in the world, and the existence of such a wonderful source of natural power has greatly encouraged the use of electricity in the surrounding country. The network of overhead transmission lines from the stations spreads in all directions, carrying current into the heart of the agricultural districts.

For many years after their discovery Niagara Falls were regarded as nothing more than one of Nature's majestic spectacles, but during last century it was seen that they also were a source of enormous power. The invention of the dynamo and the development of electrical machinery then led to the establishment on both sides of the Niagara River of giant power stations in which the generators were operated by means of water-driven turbines. These stations may be regarded as gigantic mills in which the waterwheels turn generators instead of corn-grinding machinery.

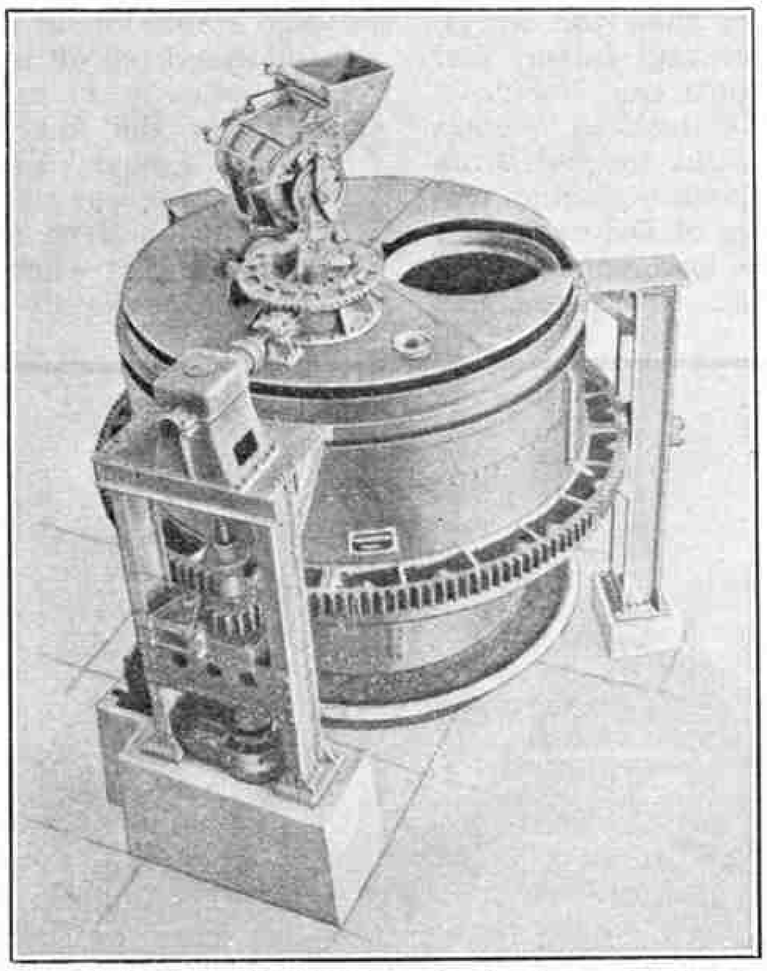
The two chief requirements of a hydro-electric power station are a good head of water and a constant flow. Both of these requirements are fulfilled without difficulty at Niagara, for the two sections of the Falls are 162 ft. and 167 ft. in height respectively, and in every second 210,000 cu. ft. of water flows over their limestone brinks.

Producing Gas for Forge Furnaces

An Interesting Plant in Scotland

IN this article we describe an interesting gas producing plant that has recently been installed by William Beardmore and Co. Ltd., at their Parkhead Forge, Glasgow. The gas is used for firing the various furnaces employed in the production of heavy forgings and castings for general engineering purposes, and the new plant takes the place of an earlier plant installed about 20 years ago. The furnaces supplied with gas include two 40-ton and one 30-ton steel melting furnaces, seven core stoves, nine forging furnaces, two steel-casting annealing furnaces, several gun-tempering furnaces and other small furnaces.

In the original plant gas was obtained from three hand-fired producers and 12 Duff gas producers, the latter being provided with special equipment for the recovery of by-products. Although the original gas plant was still efficient, the decline in the value of the by-products made it unprofitable to operate, and it was therefore decided to install an entirely new system. The new installation occupies a central position in the works and comprises three R.D.Wood type gas machines and other plant, supplied by Christmas and Walters Ltd., of London, to whom we are indebted for our information. The new equipment includes also truck tipplers and coal hoisting and ash handling plant.



One of the three R.D.Wood type Gas Producers installed at the Parkhead Forge. Our illustrations are reproduced by courtesy of Christmas and Walters Ltd., London.

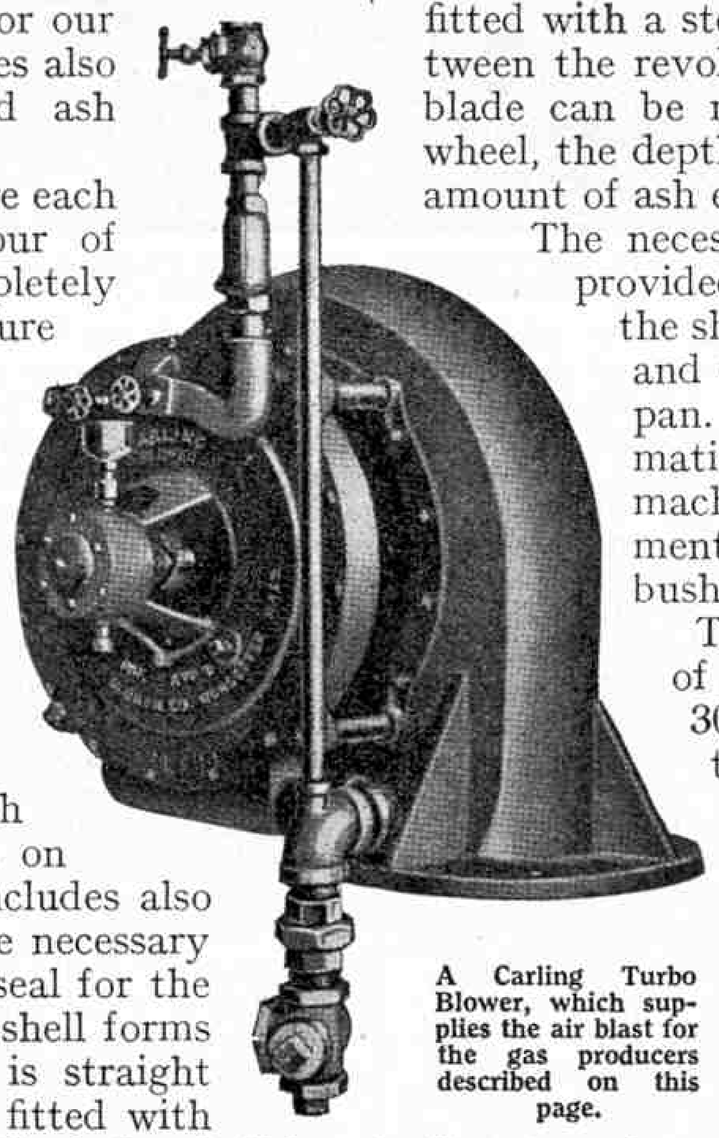
The three R.D.Wood gas producers are each capable of gasifying $2\frac{1}{2}$ tons per hour of bituminous coal and they are completely mechanical in operation. The gas-pressure is regulated by a Chowning regulator, and any fluctuations in the load due to the putting on or off of the many different furnaces are automatically taken care of, thus reducing the supervision of the plant to a minimum.

An illustration of an R.D.Wood type gas machine appears on this page. The machine consists of three portions, an ash pan, a revolving shell in which the coal is placed, and a top plate. The ash pan is made of iron and is supported on three sets of compensated rollers. It includes also a conical blast hood, through which the necessary air blast enters the shell, and a water seal for the blast pipe arrangement. The revolving shell forms the upper part of the machine, and is straight sided for half its depth, the top being fitted with a water sealing channel. The lower half of the shell is conical in shape and the whole of the inside is lined with firebrick, the inside diameter being 10 ft. Around the outside of the shell is bolted a ring spur wheel, which engages a pinion that is driven by an electric motor mounted at the bottom of the machine. To the underside of the spur wheel is fixed a tread ring, which rests on rollers fixed to three columns placed equidistant around the circumference of the machine. When the electric motor is set in motion the shell rotates on the rollers.

The top plate is also supported by the three columns, and it consists of a water-cooled pan to which are fastened the castings for supporting the coal feed, a water-cooled agitator or poker bar, an outlet for the gas and three inspection holes.

The agitator bar is a device for continually agitating the coal as the shell rotates, to ensure that every piece of fuel is thoroughly gasified. It consists of a single bar about 6 in. in diameter and 3 ft. in length, which is inserted at an angle through a bearing in the top of the shell and is rotated about the vertical axis of the bearing by a pair of bevel wheels driven from the main drive. The gas machine is driven by a variable speed motor running at from 900 to 1,350 revolutions per minute.

The ash-removing device consists of an adjustable arm fitted with a steel blade shaped to fit into the space between the revolving conical shell and the ash pan. The blade can be raised or lowered by means of a hand wheel, the depth of the blade in the ash determining the amount of ash ejected.



A Carling Turbo Blower, which supplies the air blast for the gas producers described on this page.

The necessary air blast for gasifying the coal is provided by a Carling turbo blower, and enters the shell through a pipe laid in the foundations and which leads to the blast hood in the ash pan. The coal is fed into the shell by an automatic mechanism mounted on top of the machine, and consisting of a three-compartment drum that runs in phosphor bronze bushes and rotates in a cast iron housing.

The coal-handling plant includes a pair of end tipplers, each driven by a Met-Vic 30-h.p. motor, which tip wagons up to 16 tons capacity into a bunker below ground level. A charging skip travels on a carriage beneath the opening of this bunker, and when the skip is in the correct position a trigger on the carriage opens the bunker valve and the coal falls into the skip. When the skip is fully loaded its weight releases the trigger, thus closing the valve of the hopper. The skip then travels on the carriage to the bottom of a vertical hoist by which it is raised and discharged into 35-ton feed hoppers above the gas machines.

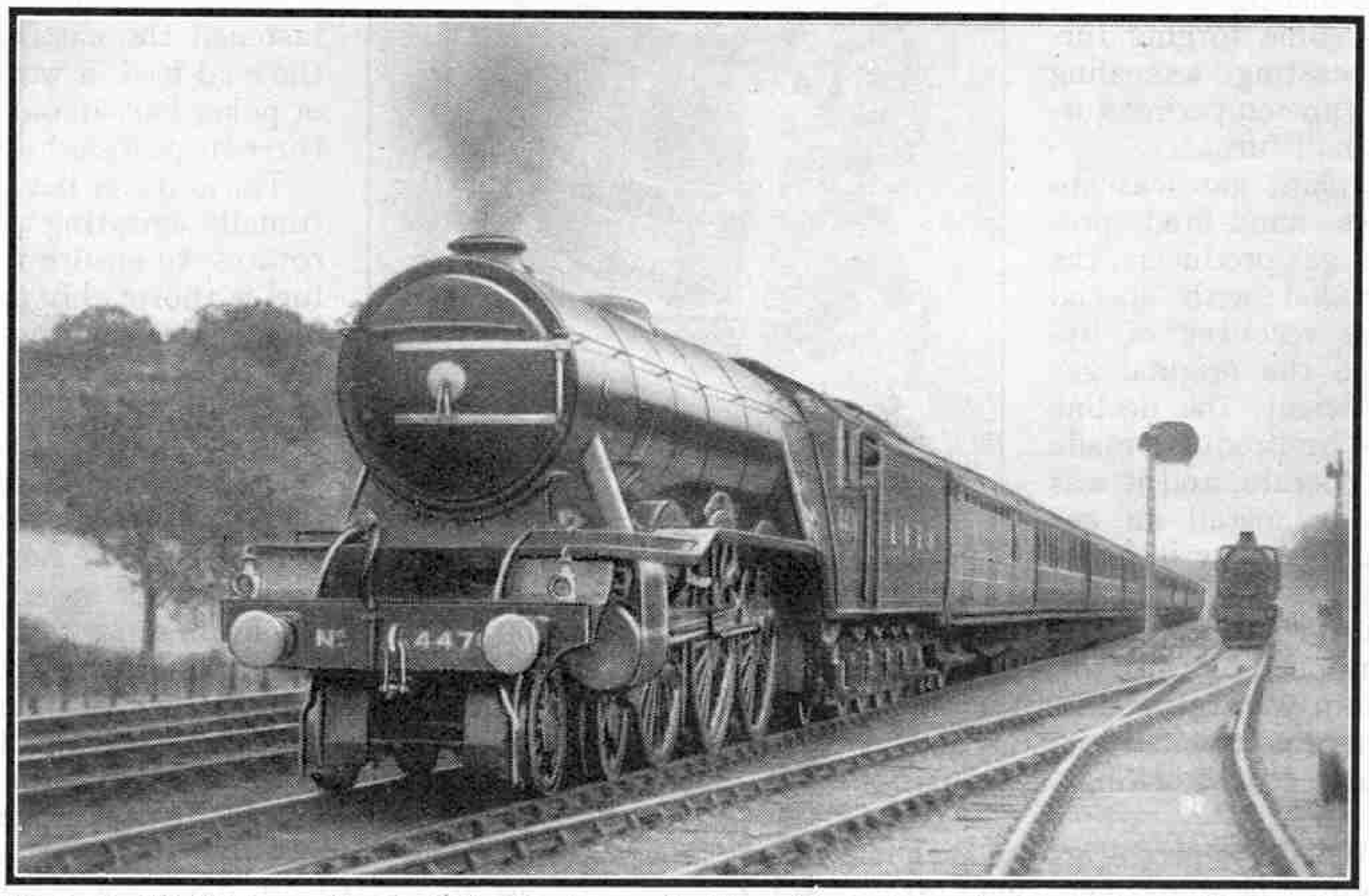
Footplate Runs on the L.N.E.R.

I. The 1-20 p.m. "Scotsman"

By a Railway Engineer

OF all British trains, none perhaps appeal more to the imagination than the Anglo-Scottish expresses. It is appropriate therefore to commence with a run on one of these famous trains. The heavy and popular 1.20 p.m. from King's Cross is a decidedly harder proposition from the locomotive point of view than the world-famous *"Flying Scotsman."* It is both heavier and faster, and is probably the hardest all-the-year-round task set to the "Pacifics."

The train is worked by King's Cross and Gateshead engines on alternate days, the same engine working right through from London to Newcastle. On this occasion a London engine was on the job, No. 4476, *"Royal Lancer,"* in charge of Driver Taylor and Fireman Luty of King's Cross shed. The load consisted of 15 coaches weighing 483 tons empty and 515 tons with passengers and luggage. It was a bitterly cold day in mid-January, and before we started it was evident that the wind was going to be troublesome. Even in London it was very boisterous, and when we got out into the open country it caught us with almost gale force at times.



The Gresley "Pacific" locomotive No. 4476, "Royal Lancer," with corridor tender, on the down 1.20 p.m. "Scotsman" at Hadley Wood. Photograph by Real Photographs Co., Liverpool.

Before we start, just a word about the footplate arrangements of these famous engines. In pre-grouping days, all Great Northern engines were driven from the right-hand side. In the first 52 "Pacifics" built, of which *"Royal Lancer"* is one, the same arrangement was used, but the newer "Super-Pacifics," which carry a boiler pressure of 220 lb. per sq. in. against 180 on the earlier ones, are all arranged for left-hand drive, which practice seems likely to become standard on all British railways except the Great Western. The regulator of the "Pacifics" is of a novel and interesting type. A shaft is carried across practically the whole width of the cab, handles are provided at both ends, and the regulator is operated by pulling either of the handles towards you. The regulator can thus be operated from either side of the cab, but the reversing gear and the brake valve are on the right-hand side. Another novel feature is the provision of a pressure gauge for the steam chests. This tells the driver at what pressure steam is actually entering the cylinders; a very important item, too, for there is often a considerable drop in pressure between the boiler and the steam chest. The cab is very roomy and comfortable. There is an excellent look-out ahead, for although the fire-box is very wide, being round-topped and not Belpaire, you can see over the top of it.

The start from King's Cross is severe. Nearly two miles at 1 in 105, through tunnels in which the rails are always wet and slippery, is not exactly an ideal stretch on which to get a 500-ton train under way. Driver Taylor started in full forward gear—65 per cent. cut-off—and had the regulator full open before we had travelled 100 yards. Without a suspicion of a slip, *"Royal Lancer"* fairly lifted the train off the mark. At Belle Isle, three-quarters of a mile out, cut-off was back to 47 per cent. Awakening all the echoes around, *"Royal Lancer"* roared up the bank to such purpose that the summit, $1\frac{3}{4}$ miles out, was passed in 5 minutes.

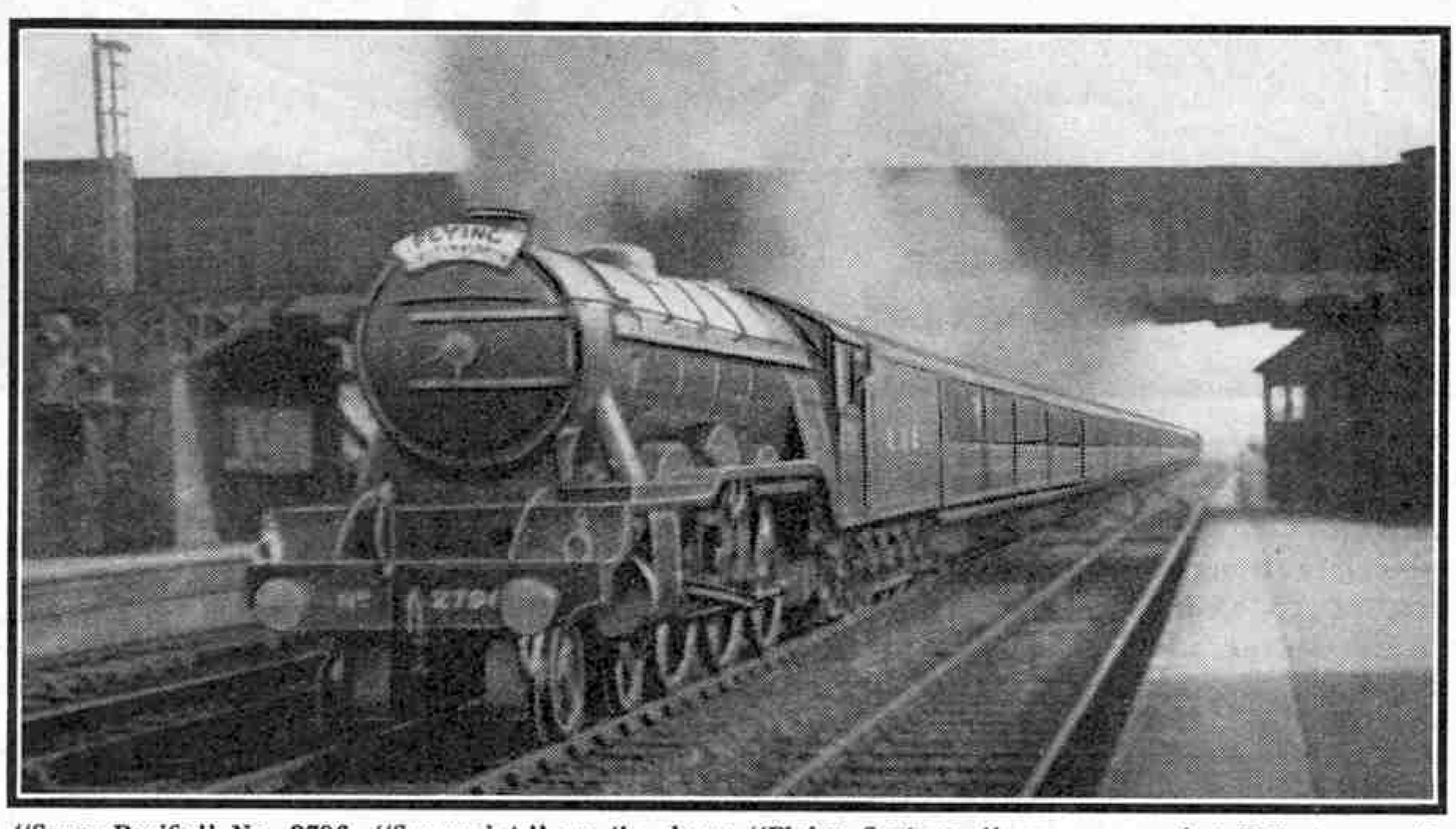
Now the cut-off was reduced from 47 to 26 per cent., speed rose rapidly to 51 through Wood Green, and we were launched on the Potters Bar bank, $7\frac{1}{2}$ miles at 1 in 200. The wind now began to make itself felt. Icy cold, it caught us viciously on the high embankment at Barnet. Cut-off was advanced to 30 per cent. and speed fell off to a sustained 40 m.p.h. We passed Potters Bar, $12\frac{3}{4}$ miles in 21 minutes. From here to Peterborough stretch 60 miles of the finest galloping ground on British railways, and *"Royal Lancer"* was not long in showing her paces. On passing the summit, cut-off was shortened to 25 per cent. and the regulator brought back to about three-quarters open. It was interesting to notice that when it was partly closed the pressure in the steam chest immediately fell. Up to now with the boiler pressure at 175 lb. per sq. in. steam chest pressure was about 165, but now it dropped to 140. This is just what might be expected, because in passing through the smaller opening in the regulator valve the steam is throttled and thereby loses some of its pressure.

We swung through Hatfield at 69, rushed the 1 in 200 bank through Welwyn tunnels without speed falling below $52\frac{1}{2}$, and then the regulator was brought still farther back for a flying descent of the Stevenage bank. We stormed through Hitchin at 75, and despite the wind, which was now catching us furiously broadside-on, reached a top speed of 79 m.p.h. at Three Counties. The ease with which the engine attained this high speed was remarkable. Cut-off was 25 per cent. and the regulator only half open. Without the wind, we undoubtedly should have travelled still faster, for such a length of train offered a big target and would produce a considerable drag on the engine.

On we swept, keeping up 70-75 m.p.h. for mile after mile; our average speed was $73\frac{1}{2}$ for 16 miles. Then a strange thing happened. Offord signals were against us; and as we slowed up, to the astonishment of all three of us, the level crossing gates were across the line! They were jammed by the force of the wind, and we stood for two minutes before they could be moved. Although we picked up speed rapidly, the delay had cost us over 9 minutes. Despite the hindrance of the wind, we should have passed Peterborough, $76\frac{1}{2}$ miles in 80 minutes, exactly as booked, but as it was we took $89\frac{1}{4}$ minutes. Speed was carefully reduced for the sharp curves at each end of the station; there was a delightful view of the Cathedral as we crossed the Nene viaduct, and then we passed through the station at 20 m.p.h., *"Royal Lancer"* clanking noisily in the characteristic fashion of these engines when steam is shut off.

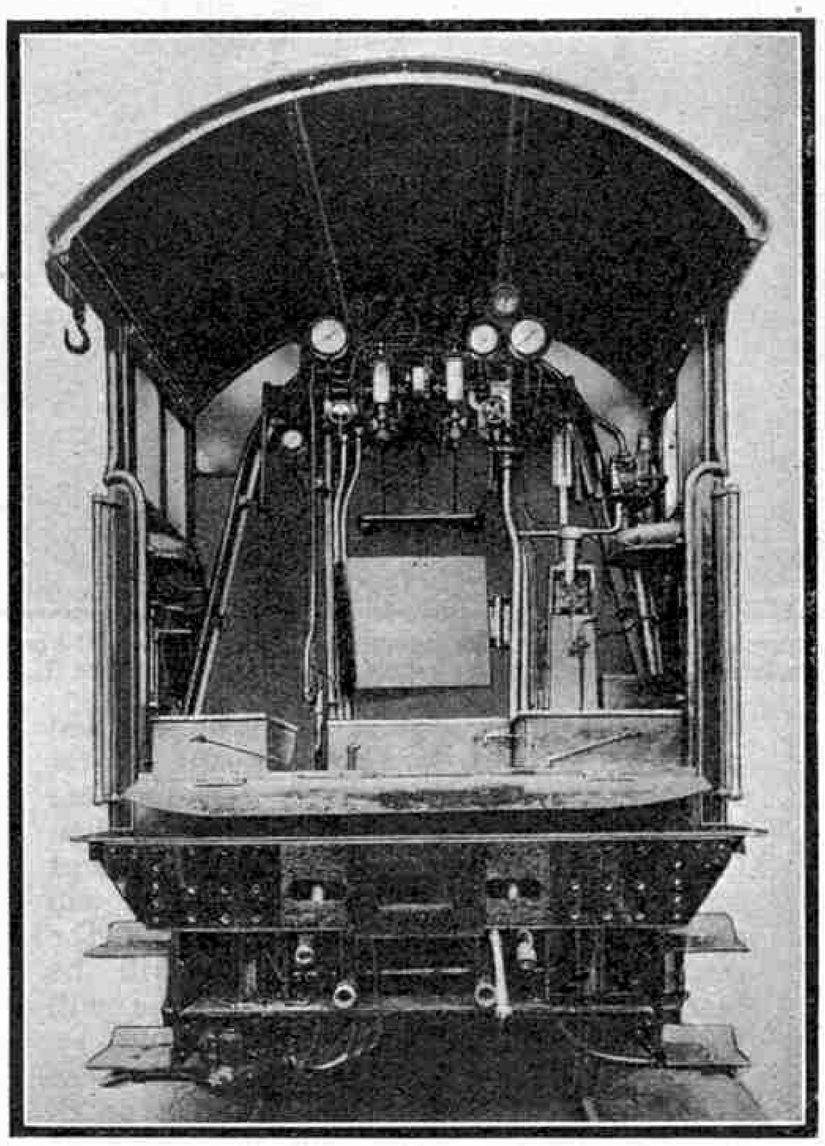
The remaining 29 miles to the first regular stop, at Grantham, involve the hardest work between London and Newcastle. For over 23 miles the line rises, very gently at first, but gradually steepening until the last $2\frac{1}{2}$ miles up to Stoke summit are at 1 in 178. Yet this 29 miles from passing Peterborough slowly to the stop at Grantham have to be run in 34 minutes. The moment we were through the station Taylor opened out to full regulator and

we got away in great style. Speed rose to 62½ m.p.h. at Tallington, and as the rise steepened was kept at 55 to 57 past Essendine. Just about here, to give his mate a short rest and an opportunity for some tea, the driver himself did a spell of firing. At Little Bytham, now climbing at 1 in 200, cut-off was lengthened to 28 per cent., and speed was sustained at 46½ m.p.h. As we approached Stoke summit the country was quite deep in snow, and the wooded hills looked very beautiful in the sunshine. On the last lap, at 1 in 178, speed fell to 45 m.p.h. The whole climb had been made at an average of 54 m.p.h., a remarkable achievement with a load of 515 tons, in view of the fact that it was only when we were over half way up that cut-off was advanced beyond 25 per cent. Touching 66 on the descent from Stoke we reached Grantham, 105½ miles, in 123½ minutes—9½ minutes late, but due entirely to the signal stop at Offord, owing to the level crossing gates being shut.



"Super-Pacific" No. 2796, "Spearmint," on the down "Flying Scotsman" express, passing Tollerton, north of York. Photograph by J. R. Sleightholme, York. (H.R.C. prize-winning entry.)

By this time the wind had dropped considerably, and later it became dead calm. And now Taylor set about regaining the lost time in earnest, for we got away from Grantham with tremendous gusto. We were doing 60 four miles from the start, passed Newark 14½ miles in 15¼ minutes at 75 m.p.h., and keeping up a fine pace across the Trent valley were through Retford, 33 miles, in 33½ minutes. Soon afterwards we entered Yorkshire, and in the failing light neared Doncaster. The passage at full speed through this busy centre was the most thrilling experience of the whole trip. Tracks converged on all sides. The high tower of the mechanical coaling plant loomed up in the dusk, and in order to get a better view of the hundreds of engines outside the running sheds I crossed to the driver's side of the cab and rode on the tender footplate. On most engines this would have been a rough passage indeed, but the big 8-wheeler rode very steadily. "*Royal Lancer*" is one of the engines that during the summer take a turn in working the non-stop "*Flying Scotsman*" between King's Cross and Edinburgh, and she is therefore fitted with a corridor tender. I stood on the wooden step that leads into the corridor, and for the few minutes I was there had a fascinating and unusual glimpse of the enginemen at work. The block sections are so short that often one can see three successive signals at once. Trains were on all sides of us—it was just like driving down a busy street—and then we swept through the big station at 60 m.p.h., 50½ miles from Grantham in 50½ minutes.



The layout of the cab fittings of the ordinary "Pacifics" with right-hand drive, as referred to in this article. Photograph by courtesy of the L.N.E.R.

Now we were running through the dead flat country of south Yorkshire, covering mile after mile at 64-65 m.p.h. until we slowed up in readiness for the passage through Selby. There is a 30 m.p.h. speed restriction here, over the swing bridge and round the sharp curve that follows. As we approached there was a delightful view of the lovely old Abbey silhouetted against the sunset sky, and then we passed steadily through the station, 69 miles from Grantham in 68½ minutes. We had just reached 60 again when it was time to slow down for York. Threading our way among a perfect maze of points we came quietly to rest in the great station. With the bold sweep of its curving platforms, and its magnificent arched roof, this is surely one of the most picturesque stations in Britain. We had run the 82½ miles from Grantham in 87 minutes—five minutes of lost time regained.

The next section, on to Darlington, is a hard one. The line crosses the Great Plain of York and is very slightly rising the whole way. So many passengers joined the train, too, that our total load was increased to 520 tons. The restart was grand. With the regulator full open, cut-off was brought back step by step from 65 per cent. on starting till at Poppleton Junction, only 1½ miles out, it was 25 per cent. Less than 3 miles out we were doing 50 m.p.h.; the mile-a-minute rate was reached in just over 5 miles, and at Alne, 11¼ miles from York, we were doing 67.

Between York and Northallerton colour-light signals of the "Searchlight" type are used. In broad daylight they can be seen over a mile away, but on this night, in the clear frosty air, the visibility was astounding. I sighted one signal 3½ miles before we reached it! Some splendid running was being made. Thirsk, 22¼ miles, was passed in 24¼ minutes; Northallerton, 30 miles, in 31¾ minutes; and we averaged 63.7 m.p.h. for 20 miles despite the gradually rising character of the line. At Northallerton we were only 3 minutes late.

But now unfortunately, there came further delays. At Wiske Moor we were slowed up to 20 m.p.h. for permanent way repairs, and approaching Darlington signals were against us, so that we took 50¾ minutes to cover the 44 miles from York. Our net time was only 46 mintues, another gain of 2 minutes on schedule time.

From the earliest days of railways Darlington has been an important centre, and it is rich in historical associations with the Stephensons. On a pedestal of honour in the station stands that wonderful old engine, "*Locomotion*," No. 1 of the Stockton and Darlington Railway. Just north of the present station the main line crosses the old route of the Stockton and Darlington, while a little farther on, alongside the main line, is the works of Robert Stephenson and Co. Ltd., the locomotive building firm founded by "Old George" in the name of his illustrious son.

Now for the last time came the "right away," and "*Royal Lancer*" roared out of Darlington and up the rising grades towards Ferryhill and the Durham coalfields. This last stretch does not offer much chance of fast running. Gradients are awkward, and in the neighbourhood of several collieries speed has to be reduced. We passed Durham, 22 miles in 29 minutes, slowing to 30 m.p.h. for the curve. Speed had risen to 65 at Chester-le-street, but then came some further slacks over colliery workings, and soon we were nearing Newcastle. We swung over the junctions at Gateshead, and crossing the Tyne by the King Edward VII bridge came to rest in Newcastle Central, 36 miles from Darlington, in 47 minutes—exactly as booked. This, for "*Royal Lancer*," her crew and myself, was "journey's end."

It had been a splendid run, with a total net gain on schedule time of 9 minutes. It was particularly interesting to see that towards the end of this 268 mile run there was no "flagging" in the engine's effort; in fact some of the finest work of the whole journey was done between York and Darlington, in spite of the gradually rising tendency of the road.

At Newcastle "*Royal Lancer*" was replaced by an Edinburgh "Super-Pacific," No. 2796, "*Spearmint*," but as the load was reduced from 520 to only 310 tons, the task of the relieving engine was an easy one indeed compared with that which No. 4476 had done so well.

British Railways and the "Silver Jubilee"

The British railways are entering heartily into the national celebrations in honour of the completion of 25 years' reign by their Majesties King George and Queen Mary. The companies are all planning to provide comfortable and expeditious transport for those who will travel to London and other centres to witness the pageants and share in the festivities associated with the "Silver Jubilee," and also are aiming to make their own distinctive contributions in commemoration of this important historic event.

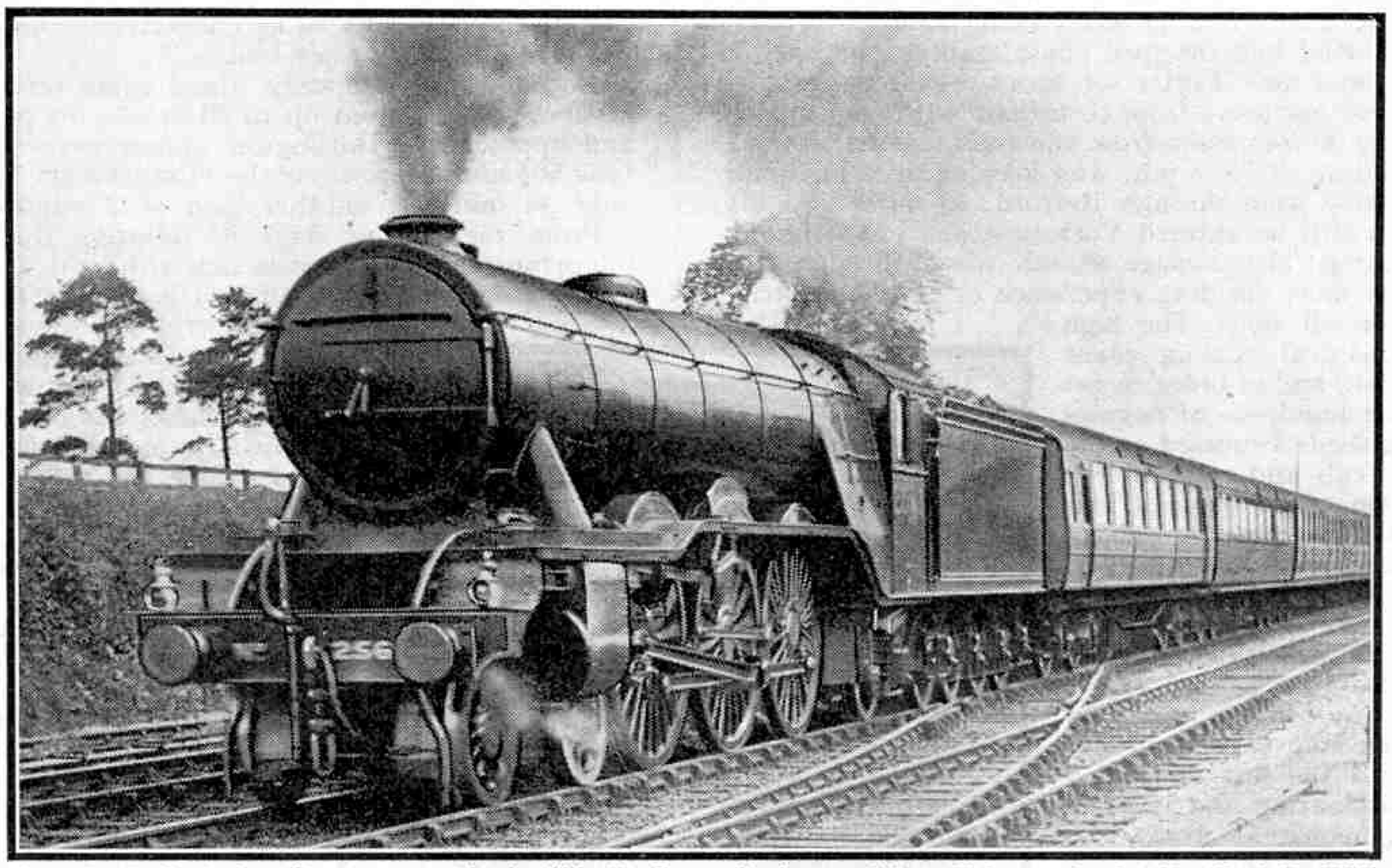
The L.M.S.R. submitted to H.M. the King a request that they might be permitted to bestow upon one of their latest express locomotives the name *"Silver Jubilee."* To this His Majesty graciously consented and that name has accordingly been given to engine No. 5552, the first engine to be built at Crewe works of the latest L.M.S.R. express passenger 4–6–0 type. This class of engine, of which 30 are being constructed during the Jubilee Year, will henceforward be known as the "Jubilee Class." In addition to receiving name plates, No. 5552 *"Silver Jubilee"* is being painted and adorned in a manner worthy of the great occasion.

It is of interest to note that among the engines of the L.M.S.R. there is a 4–4–0, No. 5348, named *"Coronation,"* that was constructed at Crewe works in 1911, the year of their Majesties' coronation.

The L.N.E.R. have decided to inaugurate later in the year a special high-speed steam-driven express to which the name *"Silver Jubilee"* will be given. It will operate between Newcastle and London, and the distance of 268.2 miles in each direction will be covered in exactly four hours. This will give an overall average speed of 67.05 m.p.h., but a call will be made each way at Darlington and the average speed between that town and King's Cross therefore will reach about 70 m.p.h.

The train will consist of first and third class corridor coaches and restaurant cars, having a total seating capacity of 194. The coaches will be built on the articulated principle, and the whole of the train, including the locomotive, will be streamlined. As specially designed rolling stock has to be constructed, and other arrangements made, it will not be possible to inaugurate the service during the summer months, but it has been decided to bring it into operation in the winter timetable commencing on 1st October next. The *"Silver Jubilee"* will then leave Newcastle daily at 10.0 a.m., except on Saturdays and Sundays, and will arrive at King's Cross at 2.0 p.m. On the return journey the departure will be made at 5.30 p.m. and Newcastle will be reached at 9.30 p.m.

The train will be available for the use of ordinary ticket holders, but a small supplementary charge will be made. If this experimental high-speed service proves successful, it is intended to add others later.



An L.N.E.R. Anglo-Scottish express passing Aycliffe. The locomotive is one of the well-known Gresley "Pacifics" No. 2569, "Gladiateur." Photograph reproduced by courtesy of the L.N.E.R.

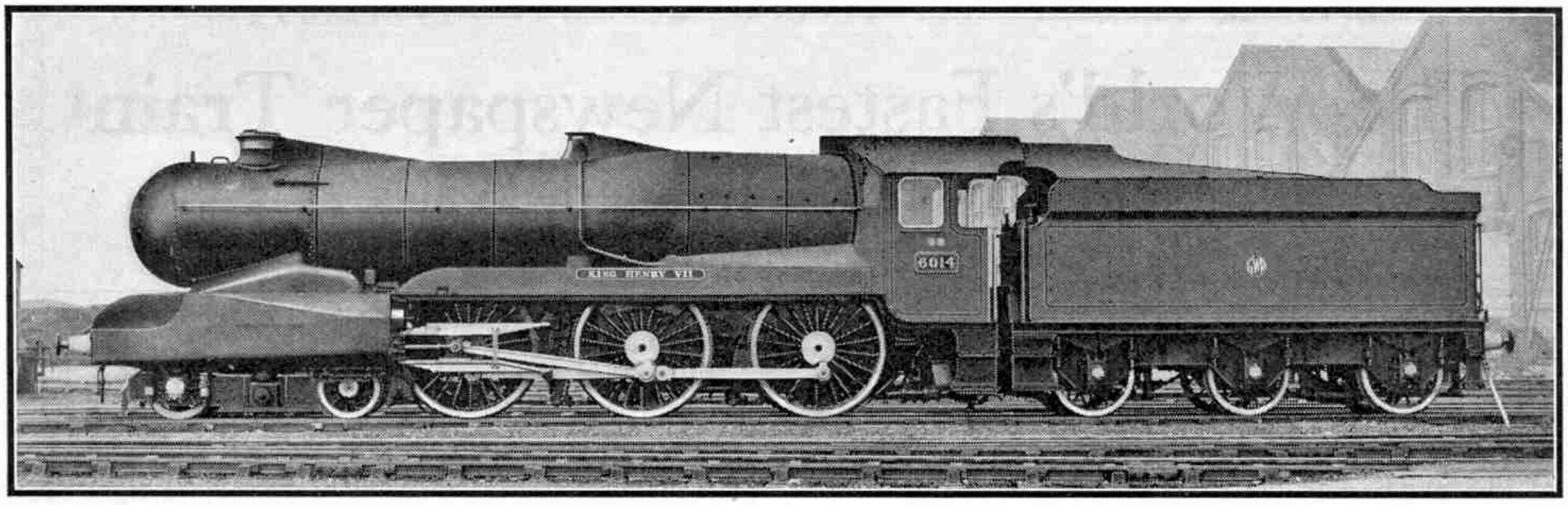
More Mile-a-Minute Services

The new spring time-tables that came into force on Monday, 29th April, include some important improvements and accelerations. On the L.M.S.R. there are three new timings at average speeds of over 60 m.p.h. start-to-stop. The 8.30 a.m. express from London Road, Manchester, to Euston is now timed to cover the 62.8 miles from Blisworth to Euston in 61 min., requiring an average speed of 61.7 m.p.h. The Perth express due at Euston at 7 p.m. covers the same section in 62 min., at an average of 60.8 m.p.h. The 9.18 a.m. express from Birkenhead has been quickened to run from Crewe to Euston, 158.1 miles, in 155 min., the average speed being 61.2 m.p.h. In addition, the up *"Fylde Coast Express,"* which already had a 60 m.p.h. schedule, has been made faster still and runs from Crewe to Euston in 154 min. at an average of 61.6 m.p.h.

The L.M.S.R. have now 10 trains daily booked at 60 m.p.h. or over, their total mileage being 1,235. It is interesting to note that four of these arrive at Euston in succession within the half-an-hour from 12.40 p.m. to 1.10 p.m.

Numerous improvements have been made in the L.N.E.R. services and others will come into operation later, the most notable being the acceleration of *"The Scarborough Flyer,"* which this summer will cover the 188 miles between London and York in 190 min., in each direction. This is an acceleration of 5 min. on last year's schedule and will demand an average speed of 59.2 m.p.h.

Some important additions have been made to the cross-country services jointly operated by the L.M.S.R. and the L.N.E.R. between Liverpool and Newcastle via Manchester and Leeds. A new restaurant car express now leaves Newcastle at 8.55 a.m. and reaches Liverpool at 1.9 p.m. Its smartest break is from Darlington to York. 43 min. being allowed for the 44.1 miles, start-to-stop. A corresponding return train leaves Liverpool at 5 p.m. and arrives at Newcastle at 9.15 p.m. These smart and convenient services show a marked acceleration on those available previously, and no doubt will prove very popular with passengers.



G.W.R. Streamlined Locomotives

The most interesting of recent happenings at Swindon works has been the streamlining of two of the standard express locomotives. The first to be adapted was No. 6014, *"King Henry VII,"* and the alterations made can readily be noted in the photograph reproduced on this page. Its bullet-nosed front is particularly striking and it will be seen that many details have been altered, all with a view to reducing air resistance. The splashers and name plates have been completely changed but the new design is quite neat and pleasing. The front of the cab is V-shaped and a cowling has been fitted over almost the entire top of the tender thus continuing the streamline back from the roof of the cab. No. 6014 certainly looks impressive and has done some very fast running in its special trials.

Even greater things are expected in the way of speed from the "Castle" class engine that has been streamlined and specially "tuned up" at Swindon. No. 5005, *"Manorbier Castle,"* is the particular engine chosen for the experiment and, as altered, has a smart appearance that gives a fine sense of speed. The engine was given a first trial trip on Friday, 29th March, and running light easily reached 100 m.p.h. The men in the works at Swindon have been keenly interested in these alterations and experiments and are confident that they will result in achievements worthy of this year, in which not only the Silver Jubilee of H.M. King George, but also the centenary of the G.W.R. is to be celebrated.

Considerable preparations are being made at Swindon for the celebration of the G.W.R. Centenary. A temporary station of old-time design has been constructed west of the erecting shop and a train has been made up with the *"North Star"* broad-gauge engine and some old broad-gauge coaches. The *"North Star"* is, of course, only a model and cannot be put in steam but means have been employed to give motion to the train and films have been taken of it.

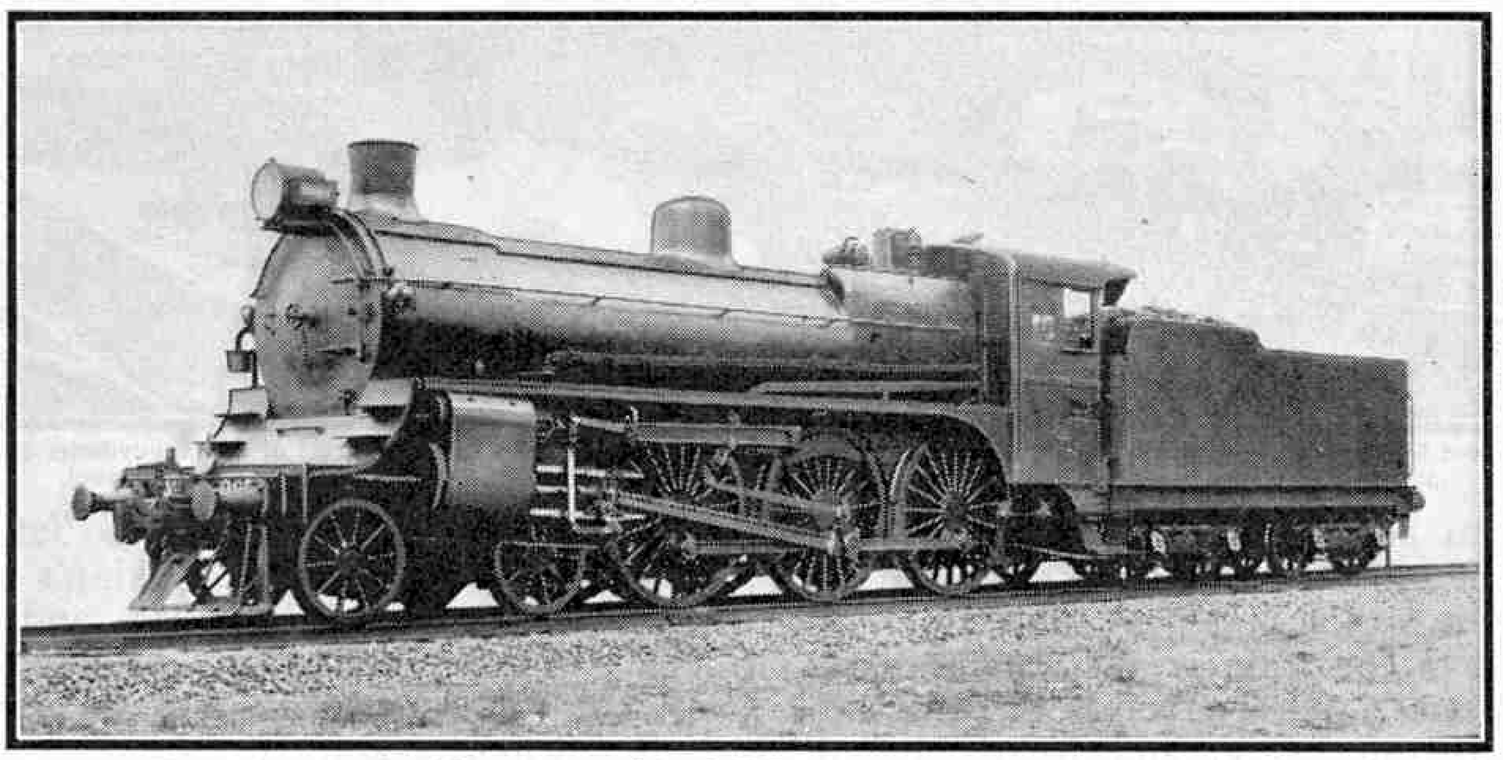
Of the 10 new express engines of the "Castle" class now under construction at Swindon, five are nearing completion and some will be out in the course of this month.

Three further 4–6–0 express engines have been condemned and taken out of service. They are No. 2918, *"Saint Catherine";* No. 2977, *"Robertson";* and No. 4024, *"Dutch Monarch."*

S.R. Cross-Channel Services

The opening of the new train-ferry service between Dover and Dunkirk, which had been fixed provisionally for the coming summer, has had to be postponed until next year owing to unexpected difficulties that have been met with in carrying out the works at Dover, where a fissure in the chalk has caused considerable trouble that has delayed the completion of the scheme. Arrangements have been made with the International Sleeping Car Co. by which, when the ferry is opened, through sleeping cars will be run between London and Paris. This will enable passengers to make the journey between the two capitals with a minimum of discomfort, since there will be no changes en route.

Meanwhile several improvements have been made in the existing Continental services and in particular the journey to Italy by the *"Rome Express"* has been shortened by three hours. The departure time from London is now 2 p.m. instead of 11 a.m., as formerly, but the arrival time remains unaltered.



The upper illustration, reproduced by courtesy of the G.W.R., shows No. 6014 "King Henry VII," recently altered to reduce air resistance. In the lower photograph is a standard 4-6-0 locomotive of the Victorian Government Railways, rebuilt with a wide chimney and improved exhaust arrangements which have given greater efficiency with lower coal consumption. Photograph reproduced by courtesy of the Victorian Government Railways.

L.N.E.R. High-Speed Runs—Coal Consumption

The L.N.E.R. have published some interesting facts relating to the coal consumption on the experimental high-speed runs between London and Newcastle on 5th March, an account of which was given on page 221 of last month's *"M.M."* It is stated that on the round trip of 536 miles the coal consumption amounted to 10 tons 15 cwt., equivalent to about 45 lb. per mile. Excluding the coal used in lighting up the engine, the consumption was about 43 lb. per mile which, considering the high average speed, is a remarkably low figure. The average consumption for L.N.E.R. "Pacific" engines working on the main line between King's Cross and Doncaster is between 50 and 55 lb. per mile. *"Papyrus,"* the locomotive employed on the high-speed run, has a normal average consumption of about 52 lb. per mile.

New 4-6-2 Locomotives Building at Crewe

Work on the 10 new 4–6–2 express locomotives of the *"Princess Royal"* type is now well advanced at Crewe and it is expected that the first will be completed in May. The series of 20 two-cylinder 4–6–0 mixed-traffic locomotives, numbered from 5000 to 5019, have almost all been finished at Crewe. The order for 50 three-cylinder 4–6–0 engines of the "5X" class has now been completed by the North British Locomotive Company Ltd., the last engines to be delivered being numbered from 5600 to 5606.

The "Claughton" class 4–6–0 locomotives are rapidly becoming extinct and at the time of writing only 13 remain.

More "Schools" Locomotives for S.R.

Three new 4-4-0 express locomotives of the S.R. "Schools" class have been finished at Eastleigh and sent into traffic. They are 930, *"Radley";* 931, *"King's-Wimbledon";* and 932, *"Blundell's."* The next of the class, No. 933, *"King's-Canterbury,"* is almost ready for service.

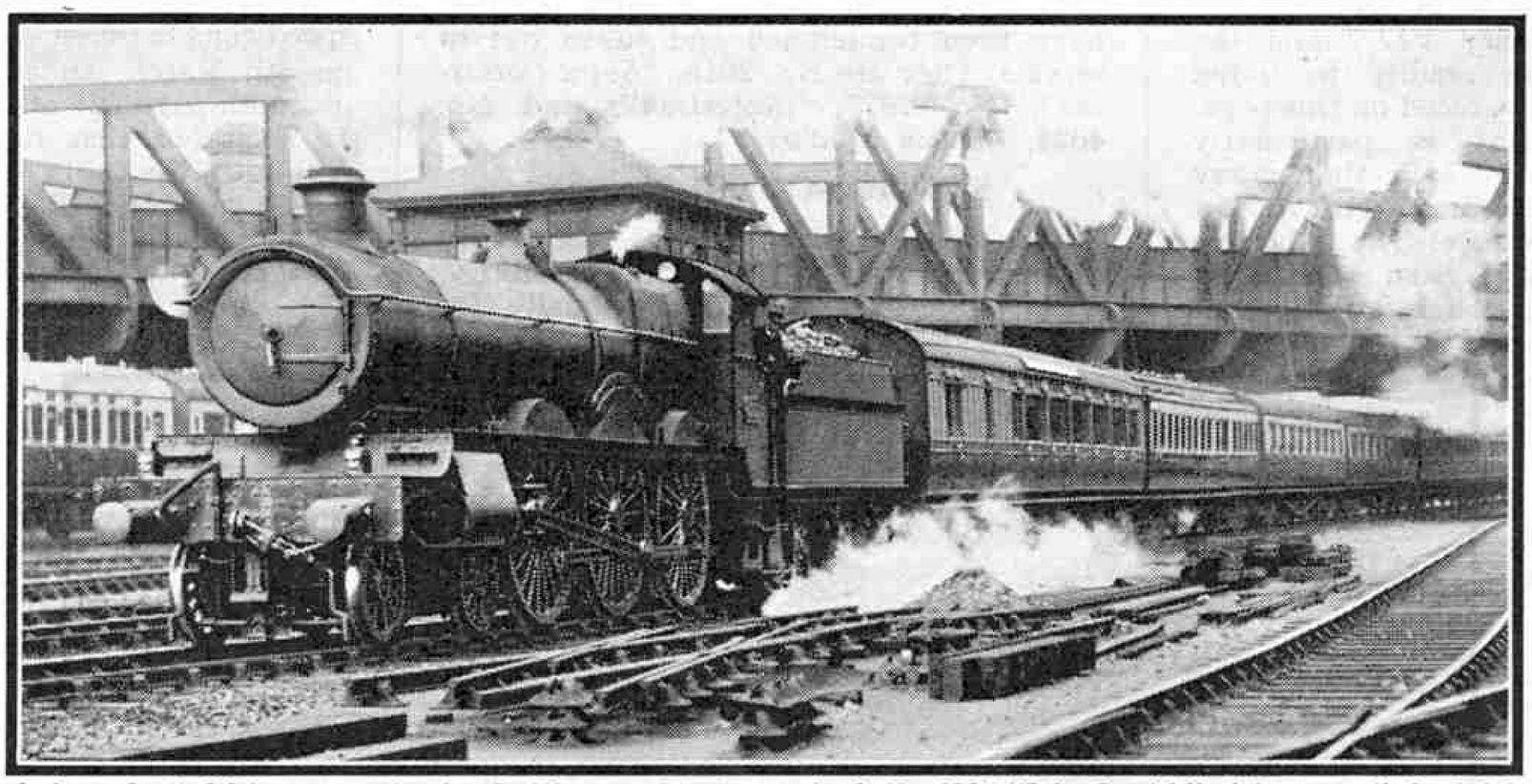
The World's Fastest Newspaper Train

From Paddington to South Wales

By C. S. Lock

ON 2nd October last the G.W.R. introduced the world's fastest newspaper train, to run between Paddington and the principal stations in South Wales. Starting at 1.20 a.m., the train runs "non-stop" to Newport—133½ miles—in 137 minutes, an average speed of 58.5 m.p.h. Previously the record was already held by the G.W.R. with their 12.50 a.m. train from Paddington, introduced on 12th March, which averages 56.5 m.p.h. between London and Plymouth.

The new service operates on Mondays to Fridays, and provides a 45 minutes' acceleration over the service previously given by the 1.0 a.m. train from Paddington, which it superseded. This saving in time has been achieved by a 20 minutes' later departure and, what is more important, a 25 minutes' earlier arrival—a vital factor, as it enables newspapers to be distributed throughout this wide area, so that in practically every town or village the favourite paper may be on the breakfast table.



A down South Wales express leaving Paddington. The locomotive is No. 2927 "Saint Patrick" of the two cylinder 4-6-0 class that have made a special reputation on these services. Photograph by Real Photographs Co., Liverpool.

After Newport, where the train is due at 3.37 a.m., it stops at Cardiff at 3.59 a.m., afterwards at Bridgend, Pyle, Port Talbot, Briton Ferry, and Neath, before reaching Swansea at 5.44 a.m., from which point the newspapers for places farther west are forwarded by the 6.5 a.m. train.

From each of these "key" points the papers are distributed throughout South Wales and the valleys by local rail and road services, which give early arrival times. For instance, at Tredegar at 5.39 a.m.; Blaenavon, 5.44 a.m.; Ebbw Vale, 6.10 a.m.; Pontypridd, 5.37 a.m.; Porth, 5.48 a.m.; Treherbert, 6.22 a.m.; and Merthyr, 6.33 a.m.

The initial run clearly demonstrated the train's ability to keep its fast schedule—and with something to spare. The writer was privileged to be on the footplate, to supply a first-hand description to readers of the Magazine.

At 1.20 a.m. the "*Saint Andrew*," engine No. 2913, with a load of nine vehicles and 50 tons of papers aboard, steamed out of Paddington station as smoothly as a bird in flight. Ahead, the myriads of red, green, and amber searchlight signals illuminated the line and made miniature rainbows on the shining faces of the metals. Soon they gave place to the more familiar semaphore signals, and we plunged into a darkness from which we did not emerge until near our journey's end.

All sense of speed was lost in the utter darkness, but replaced by an uncanny sensation of rapid movement through space, with vague shadows on either side. There was no need to look behind from my corner on the footplate to see what was happening in the cab, for night had kindly turned the side window into a mirror which reflected through the fireman's look-out everything on to the side of the boiler in front conveniently for my gaze. I watched the fireman at his work, incessantly feeding the fire, spraying the coal to keep down the dust, or taking up water, without so much as turning my eyes from the track ahead.

Reading station: 36 miles in 33 minutes; Goring, a white board by the line side, and down went the scoop for the first of three drinks from the water troughs.

In the cab the pounding of the wheels, so familiar to passengers, took on the deep throb of a ship's turbines. A red light ahead; brakes gently applied, and then released as it changed to green. Cholsey—another check, but we made Didcot three-and-a-half minutes early.

A red light again, one that refused to change until we had stopped dead for three precious minutes. Away again, swaying, thundering, surging forward at 70 miles an hour through the night, with all the news of the day behind. Never a word from the driver. Hand on throttle, he stared ahead into the inky darkness. What trust he must, and does, place in track, signals, fellow-railwaymen, and the friendly little bell of the automatic train control which seemed to bring a cheery message from an outer world to the men in the cab.

"I know where you are," it seemed to say. "I'm watching over you!"

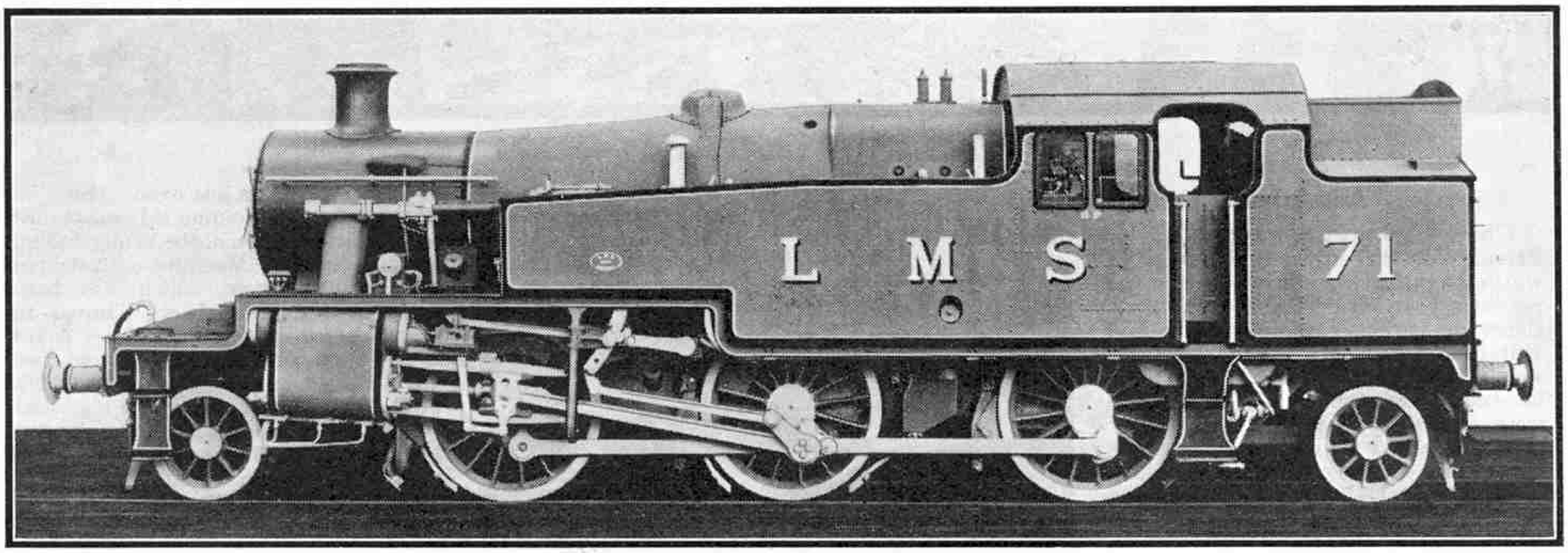
Swindon, the enginemen's home town. I glanced at the men, both as "on parade" as we swept through the station and by the famous works. Badminton—100 miles in 100 minutes! Filton—the aerodrome buildings illuminated and looking at a distance, for all the world like the "Night Mail" at speed.

The way to Wales ahead. Down into the Severn Tunnel—four-and-a-half miles of pitch darkness surrounded by sound, echoing and re-echoing, now as of torrential hail beating on glass. Smoke streaming back in a wide, white band. Ear drums distended. Now we

(*Continued on page 316*)

New Tank Locomotives for the L.M.S.R.

Interesting 2-6-2 Design



IN April 1930 there appeared the L.M.S.R. 2–6–2 tank locomotives of the then "15500" series, and the first of the class was illustrated and described on page 451 of the "*M.M.*" for June of that year. These engines were introduced in order to replace to some extent the older designs of tank locomotives on lighter suburban duties.

The class now numbers 70 engines, previously Nos. 15500–15569, but under the new numbering scheme Nos. 1–70. Twenty of them are fitted with condensing gear and special vacuum trip cock apparatus, for working in the London district on Midland Division duties involving running over the Metropolitan lines. Those turned out since the advent of Mr. W. A. Stanier as Chief Mechanical Engineer are characterised by the projecting rivet heads on the tanks and bunker, whereas in the earlier engines these rivets were finished off flush with the plates.

With the need arising for more of these handy engines, Mr. Stanier has taken the opportunity to adapt the original design of Sir Henry Fowler to conform with the standards now set up. Readers will already be familiar with the characteristic appearance of "Stanier" locomotives, and the photograph on this page shows how the various features of the latest standard practice have been applied to the original design. The first 20 of the new engines are Nos. 71–90. A further 54, Nos. 91–144, are to be constructed at Derby under the 1935 locomotive building programme.

The photograph above, reproduced by courtesy of the L.M.S.R., shows the first of the new 2-6-2 tank locomotives with tapered boilers. The general dimensions of these engines are given below.

Cylinders	
Diameter	17½ in.
Stroke	26 in.
Wheels	
Leading and Trailing	3 ft. 3½ in.
Driving	5 ft. 3 in.
Heating Surface	
Tubes	774.5 sq. ft.
Fire-box	103.9 sq. ft.
Superheater	75.9 sq. ft.
Grate Area	17.5 sq. ft.
Working Pressure	200 lb. per sq. in.
Tractive Effort at 85 per cent. working pressure	21,486 lb.
Adhesive Weight	45 tons 10 cwt.
Weight of Engine in working order	70 tons 15 cwt.
Coal Capacity	3 tons
Water Capacity	1,500 gallons
Total length of engine over buffers	41 ft. 11¾ in.

The cylinders of the new locomotives have the same diameter and piston stroke as those of the first engines, 17½ in. and 26 in. respectively. The crossheads now operate between double slide bars, however, whereas in the first engines single slide bars with the crossheads embracing them were employed. The piston valves, which are arranged to have a long travel, are operated as before by Walschaerts valve motion, controlled by screw reverse gear from the cab. Lubrication of the cylinders, the piston rod packings, the piston valves and their spindle bushes is effected mechanically by means of lubricators of standard pattern.

The cylinders are inclined slightly and are connected to the driving wheels by rods of high-tensile manganese molybdenum steel, in accordance with the latest practice. The connecting rods are fluted, but the coupling rods, which are made of the same material, are of rectangular section. All the wheel centres are steel castings with the now familiar triangular rim section. The balance weights of the driving and coupled wheels are built up of steel plates riveted to the spokes, adjustments for balance being made by the addition of a suitable amount of lead between these plates.

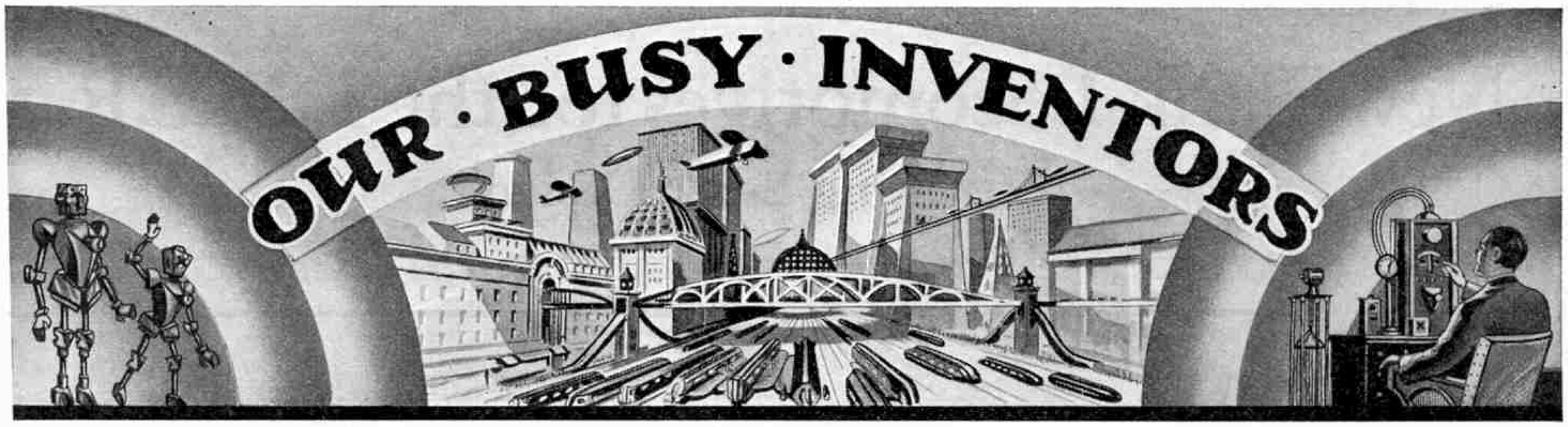
The coupled wheel axle-boxes are as usual steel castings, with pressed-in brasses having suitable white metal crowns; and oil grooves are provided on both sides of the crown to ensure a thorough distribution of oil to the axle journal. The crown of each box has an independent oil feed from a mechanical lubricator with the standard back-pressure valves and flexible oil pipe connections. Each axle-box underkeep carries an efficient oil pad, and these can be examined by sliding out the underkeeps while the axle-boxes are in position. Each box is fitted with a dust shield carried on the inside face.

All the laminated bearing springs for the coupled axle-boxes are of silico-manganese steel, the plates being of ribbed section and the fixing of the buckle of the cotter type. The spring links are of the screwed adjustable pattern. The leading and trailing ends of the locomotives are supported on two-wheeled Bissel trucks anchored to cross stretchers between the main frames, the weight on each truck being taken through side bolsters. The side check spring gear has been arranged to ensure smooth and easy riding.

A tapered boiler replaces the boiler with parallel barrel fitted in the original design, and is actually domeless, the dome-shaped cover on the barrel serving to accommodate the top-feed apparatus. The regulator valve is therefore incorporated in the header of the moderate-degree superheater in the smoke-box. Two Ross "pop" safety valves are provided on the Belpaire fire-box to relieve the boiler, which has a working pressure of 200 lb. per sq. in. as in the original design.

The now usual steam manifold with a main shut-off valve is provided at the top of the fire-box door-plate in the cab, and to this manifold are attached valves for various auxiliary fittings. The coupled wheels are acted upon by the steam brake operated by the driver's vacuum brake valve. A hand-brake also is fitted. The sanding is of the mechanical trickle type and in addition a de-sanding apparatus comes into action simultaneously, so that after the passage of the wheels the rails are automatically cleaned.

The design of the original cab has been modified to incorporate two sliding windows on each side. All fittings are arranged for convenient handling, and the drive is arranged on the left-hand side. As in the three-cylinder 2–6–4 tank locomotives of the "2500" series, the coal bunker is so made as to ensure a good view when running backward. This carries three tons of coal and the tanks accommodate 1,500 gallons of water.



By P. A. Tent

British Inventors Become Busier

I have been greatly interested to find that during 1934 Great Britain was the only large country in which inventors were busier than in the previous year. The number of applications for patents registered in Great Britain and Northern Ireland last year was 37,429, or 685 more than in 1933. On the other hand, in Germany there were 52,856 applications, 3,137 fewer than in the year before, and in the same period the number of patent applications in the United States decreased from 59,408 to 56,096. The drop of 3,312 in the case of the United States does not seem large in comparison with the number of applications, but invention there appears to be under a cloud, for as recently as 1930 there were 91,430 applications, the largest number ever recorded in that country.

The increase in patent business in Great Britain is very satisfactory, for to a certain extent the activities of inventors reflect commercial and industrial progress. In this connection it is interesting to find that during 1933 the British Patent Office made a profit of £173,760. This was nearly £30,000 more than in the previous year, and the great increase adds point to the suggestion, to which I made reference in the "*M.M.*" for March of last year, that at least a proportion of this sum should be devoted in some way to encouraging inventors in developing devices and ideas that promise to be successful. Alternatively, an effort might be made to reduce fees, a step that would be very helpful to those inventors who find difficulty in raising the funds for their experiments and for securing protection for their ideas.

A New Way in an Old Industry

The task of the inventor is perhaps hardest when he is trying to devise means of replacing operations that have for ages been carried out without question in a certain way. Cutting wood is a good example of this. Countless generations of people have used saws for this purpose, and improvements have consisted simply of alterations in the shape of the primitive tool in order to make it more efficient, or to enable it to be driven by an engine of some kind. Most of us indeed have looked on some form of saw as natural or indispensable in wood-cutting work, but inventors have thought differently and have striven to find satisfactory means of slicing it with some form of knife.

Clearly slicing must be far more economical than sawing, but I think many of my readers will be surprised to learn that 50 per cent. of the wood is wasted by conversion into sawdust when boards $\frac{1}{8}$ in. thick are being sawn, and 16 per cent. is lost even when $\frac{3}{8}$ in. boards are being produced. The problem of avoiding this waste now appears to have been solved by the introduction of the White-Fiddes Rotary Slicing Machine, illustrated on the next page, which has been hailed as the ideal slicer. Timber to be cut is fed into one of three boxes on the table of the machine, and two knives on a heavy disc rotated at high speed slice boards from it. The feed boxes of the machines shown in the accompanying photograph are large enough to enable boards measuring 36 in. by 12 in. to be cut. Six sliced boards are produced at every revolution of the disc, which makes 75 r.p.m., giving an output of 450 boards a minute.

The Autoscythe in action, cutting the coarse grass of roadside verges. This illustration and the upper one on the opposite page are reproduced by courtesy of Charles H. Pugh Ltd., Birmingham, 9.

Replacing the Scythe

We have become accustomed to the use of the lawn mower, driven either by hand or by means of a petrol engine, and horse-drawn or tractor-hauled machinery has long been in use for cutting meadow grass. Until recently, however, rough grass under trees and in odd corners of the garden, or on the verges of roads and in chicken runs and other confined spaces, could only be dealt with satisfactorily by means of the scythe, which for this and similar purposes has lingered on from the age before the introduction of machinery. For many operations even this has now been replaced by cutters driven by the all-conquering internal combustion engine, and the illustration on this page shows a new machine of this kind, known as the "Autoscythe," that can readily be used for cutting rough and overgrown grass, bracken, and even heather, on either level or undulating surfaces. It works on the same principle as a reaping or mowing machine, a serrated blade being driven backward and forward between pointed fingers at high speed, to shear the blades of grass or the stems of undergrowth with which it comes into contact. It is capable of good work on steep embankments and in other difficult conditions.

The most ingenious feature of the Autoscythe is that it is not propelled by the motor, the purpose of which simply is to drive the cutter. Instead it is pushed forward by the operator, who is able to adapt his speed to the type of growth that is being cut, moving forward quickly where this is light and easily dealt with, and more slowly where it is thick and heavy. Thus the cutting blade can be given the time required to make a perfect cut.

The Autoscythe is equipped with a 68 c.c. air cooled motor, and with a cutter bar 3 ft. in length is capable on normal grassland

of dealing with about two acres a day. For road work, or for operations generally in places where a firm hard surface is offered to the road wheel, it can be fitted with a pneumatic tyre; in other conditions a steel wheel is employed.

Wonderful New Plastic Material

A short time ago I made special reference to the introduction of synthetic plastic materials, one of the most remarkable of recent industrial developments. We owe such products to the chemist, who has devised means of making these resinous bodies from various sources. The first to attract general notice was bakelite, made by heating certain coal tar products with formaldehyde; but to-day there is an immense range of similar products that are chemically very stable and can readily be moulded in steam-heated dies operated by large presses. They are used chiefly in the form of moulding powders, which can be suitably coloured before use; and articles made from them have a very attractive appearance. If necessary, metal inserts and connections can be embedded in the finished product, and thus complicated electrical devices can be built up in a simple manner.

Recently a great step forward in the production of plastic materials was made by the introduction of Leukon, a product of the research department of Imperial Chemical Industries Ltd. This was one of the novelties to be seen at the British Industries Fair in February last. It is a transparent synthetic resin that resembles glass in appearance, and can be produced in the form of a solid capable of being machined and drilled. As yet, however, it is available commercially only as a moulding powder.

Leukon is almost unbreakable and can be turned and polished almost as well as ivory. It is very light in weight, and may prove a useful substitute for glass, for it is less costly than glass of high quality, does not splinter when broken, and has the great merit of allowing ultra-violet rays to pass through it. There is no difficulty in colouring it, and it promises to be invaluable in the production of all kinds of transparent, translucent or opaque articles that are both useful and decorative. In addition it is an excellent electrical insulator and a poor conductor of heat.

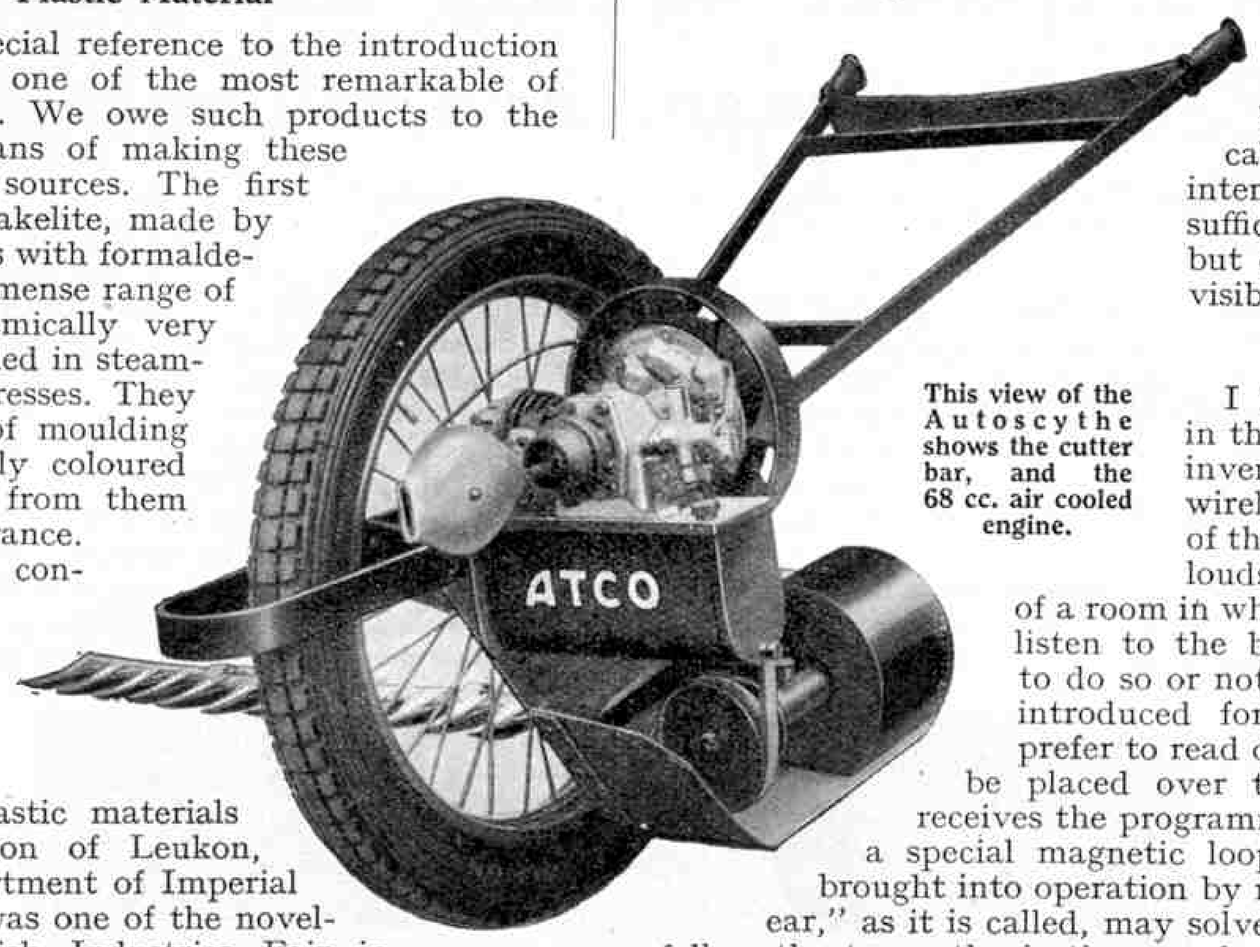
Gadgets for Motorists

The inventor is always busy in the motoring world, and apart from major inventions such as automatic gear-boxes, there seems to be a never-ending stream of gadgets intended to ease the path of the motorist. Some of these are of little importance, but many are valuable and ingenious. For instance, motorists who have experienced trouble when fuses have blown out, and spares have been mislaid, will welcome a novel fuse at the end of which is a small reel. The fuse wire itself is of sufficient length to ensure about half-a-dozen replacements, and the surplus is wound on the reel. As soon as a fuse blows all that is necessary in order to complete the circuit is to unwind a little more wire from the reel.

Dazzle due to powerful lights has attracted the attention of many inventors, and various devices have been suggested for overcoming the difficulties it causes. One of German origin is a double electric light bulb, the lower half of which is covered with a yellow glass that acts as a reflector and gives a flat-topped beam that does not cause dazzling effects.

For the protection of drivers who encounter others making use of powerful headlamps, or who find driving into the sun tiring, a form of window screen glass with shaded colouring has been produced. The colour is dense at the top of the screen, but fades away lower down, to leave the lower two-thirds of the screen clear. Thus between himself and the lights of an oncoming car, whatever their intensity, the driver of a vehicle fitted with the device can interpose a screen of sufficient density to prevent dazzle, while leaving the road ahead distinctly visible. This protection can be applied to the full width of a windscreen and will be appreciated by passengers as well as drivers.

Dazzle may arise from the headlamps of overtaking cars by causing annoying reflections within a saloon. It is impossible to avoid this by pulling down the blinds of the rear windows of cars fitted only with interior driving mirrors, but now a special blind has been introduced in which there is a panel of violet blue translucent material called celastoid. This reduces the intensity of troublesome lights sufficiently to prevent reflections, but does not interfere with their visibility in the driver's mirror.



This view of the Autoscythe shows the cutter bar, and the 68 cc. air cooled engine.

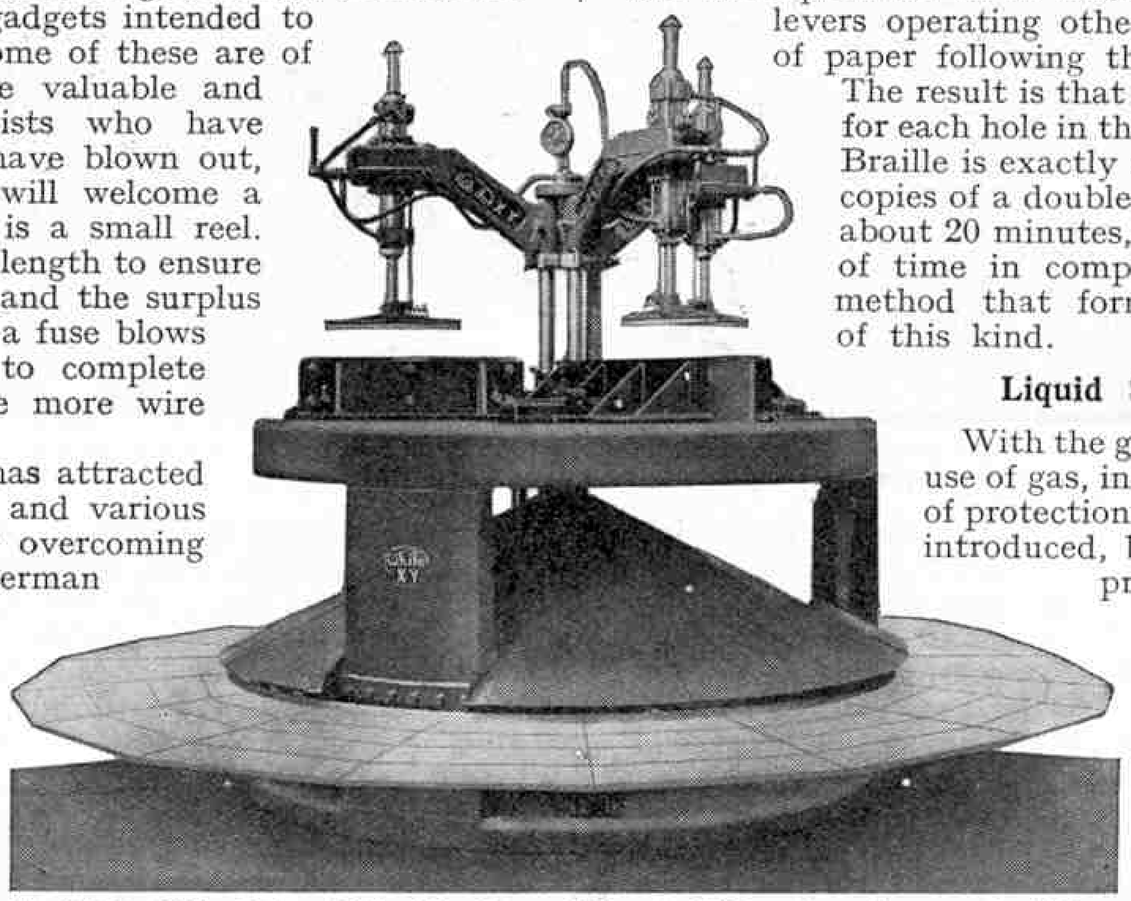
"Silent Wireless"

I have been greatly interested in the production by an American inventor of what is called "silent wireless." One of the difficulties of the universal employment of the loudspeaker is that every occupant of a room in which a wireless set is used must listen to the broadcast, whether he wishes to do so or not, and this invention has been introduced for the benefit of those who prefer to read quietly. It is an attachment to be placed over the ears of listeners and it receives the programmes from what is described as a special magnetic loop fitted to the receiver and brought into operation by means of a switch. The "radio ear," as it is called, may solve many of the difficulties that follow the too enthusiastic use of powerful wireless sets.

Simple Device for Braille Writing

A field of invention in which I always take special interest is concerned with efforts to improve the lot of those suffering from blindness. The invention of Braille writing enables those who are unable to see to use their sense of touch for reading purposes, but the production of Braille books is costly, especially when few copies are required, and for this reason Braille books have been restricted to those for which there is the greatest demand. Now a machine has been designed for copying in Braille text books and other literature required only by a few people.

The Braille alphabetical system makes use of varying combinations of raised or embossed dots arranged in vertical columns, and in the new machine a master sheet is employed in which the dots are replaced by holes. As this sheet passes through the machine spring loaded needles or styles press against it, and pass through the holes punched in it. Each needle is fitted with a system of levers operating others that emboss dots on six sheets of paper following the movement of the master sheet. The result is that a raised dot is formed on each copy for each hole in the master sheet, and thus the original Braille is exactly reproduced. The machine allows six copies of a double-sided page of Braille to be made in about 20 minutes, and thus shows an immense saving of time in comparison with hand work, the only method that formerly could be used for writing of this kind.



The White-Fiddes Rotary Slicing Machine, which cuts 450 boards, each measuring 36 in. by 12 in., in a minute. Photograph by courtesy of T. White and Sons Ltd.

Liquid Sprays to Fight Gas Attacks

With the growing threat of air warfare and the use of gas, inventors naturally are seeking means of protection. Many forms of gas mask have been introduced, but their use leaves untouched the problem of making the air breathable immediately after it has been saturated with gas, and it is interesting to find that a device for this purpose has been introduced and tested by the Hastings Fire Brigade. It is simply a nozzle that produces an extremely fine spray of water into which a suitable acid or alkali has been introduced. Fine sprays have been found effective in dispersing smoke and the addition to them of a chemical will enable them to overcome the additional difficulties caused by the use of poisonous gases.

The invention will have its uses in peace as well as in war, for it can be used in clearing the atmosphere in the case of a fire or accident in which chemicals are involved. For instance, containers filled with acids may be wrecked in a street mishap. In the past it has been very difficult to clear the surrounding air of acid fumes, but the use of the new spray will overcome this trouble.

Famous Explorer Writes for the "M.M."

IV.—A Capture and its Thrilling Sequel

"*BWANA! Bwana!*"

The native who had appeared before the door of my tent was panting so heavily that he could say no more, and his black muscular body was gleaming with perspiration. He must have been running desperately, for it takes a lot to make a native perspire and pant. That boy, Itaita, must in fact have run all the way through the expanse of forest—ordinarily four hours' march—that separates our base camp from Okapi Camp Number One where he was stationed.

The tom-tom of the camp which, by an unwritten law, cannot be beaten except at my order, was filling with crazy, excited rhythm the big clearing, and from every direction our natives, a good hundred, were running towards my tent, waving in the air their implements of work, jumping and dancing.

It was not difficult to understand what had happened—an okapi had at last fallen into one of the *zemu*.

Thirty *zemu*, or pits, I had had dug; deep holes covered with sticks and leaves, surrounding a large natural clearing on the river Mutwegwe, discovered in the course of our researches in the forest. At half an hour's march from that clearing we had picked up a site for a permanent camp, Okapi Camp Number One. But though we had spent days and weeks of toil near that camp and the three others we had established each time we penetrated farther into the unexplored parts of the forest, the okapis had managed to elude every effort of ours to capture them.

For three months I had been bending every effort to capture a specimen; and what three months spent in the equatorial forest in constant work and march means can only be realised by one who has tried it. Continuous fights to keep with us the natives enrolled on the Boni-Irumu road and terrified of the forest; and with the pygmies, indispensable guides and trackers, who wanted to wander only in the parts of the forest they knew, and in full independence, when and how it suited them. Fights with the scorching sun of the equator that liquefies and exhausts you, and with the sudden daily storms that ice you and flood everything around you. Fights with the myriads of insects of every kind and with thorns and trees and lianas and bushes, with holes and swamps. And especially with oneself; with lungs and heart and head and nerves, which an hour's march in the forest is sufficient to make undisciplined, and a day's march to put in complete debacle. However, for three months I had kept at it, and the palisade I had prepared at the base camp was still deprived of the two okapis the Belgian Government had given me the exceptional permit to capture and export to England for the London Zoological Society.

Now, finally, here was Itaita with the welcome news that a grown male, enormous and in perfect condition, was there in a *zemu* at my disposal at a few hours' distance, as safe as if he were in a cage. A hundred times okapis had approached those pits, which were so well built and cared for that Dugdale, one of my companions, one day in making a tour of inspection fell himself into one of them! Ten times an okapi had slipped inside with a front leg, and three times with both legs. But on each occasion the extraordinary cunning of the animals saved them, and they had bolted back and run away. This was why our 100 natives now shouted like mad all round my tent, bestowing on the shoulders of poor Itaita congratulatory slaps sufficient to demolish him. They were full of happiness because the work of their *Bwana* was finally crowned with success; and also and even more because their childish minds summed up the situation, as always, in the easiest way. Now the *Bwana* would go back to his far country, his funny mania of capturing live okapis satisfied. *Basi*—which means "enough" or "away with it"—with living in that forest full of mysterious dangers, with walking for days and days carrying heavy cases that branches and ravines constantly snatched from one's head. *Basi* with toiling to dig holes while a leopard could surprise one unarmed, and with sleeping always in new places where nobody has been before, and which are under the control of who knows what malignant spirits. *Basi* with going continually through thick bushes, from which every moment a buffalo may jump out, or a bongo with its sharp horns, or even worse, one of those terrible beasts that inhabit the taboo parts of the forest—birds bigger than a man, and apes more ferocious than a gorilla; snakes and dragons and other creatures too horrifying even to think about.

Commander Gatti trying to administer an anæsthetic to an adult okapi captured in a pit. He is wearing an old war gas mask for self-protection.

It was this line of reasoning that made them attack the work I at once gave them with an alacrity and an energy never seen before, grabbing machetes and axes and hoes and hacking away at the trees and undergrowth of the little path we had previously cut to unite the two camps. They knew it must be enlarged to permit the passage of the big stretcher on which I was planning to bring the okapi back to the palisade near our base camp.

As I walked, or rather ran, toward the *zemu* with all the speed that joy and impatience can give, I was followed by the glamourous song of my men. "A big okapi has now come to the *Bwana*," improvised the official song-leader. "And a big *matabisha*, a generous tip, will come now to all of us," answered the chorus in a storm of machete slashes.

The superb animal I found when I reached the *zemu* some hours later surpassed all my expectations. A good 6 ft. at the shoulder, he filled almost completely that 10 ft.-long, 3 ft.-wide pit, and when he raised his head his nose reached just to the top of the hole, 11 ft. The legs, of course, I could not see, but the back and neck, of a red so dark as to appear black, with the thick red mane running from the ears to the tail, was simply a poem of strength and power. The head, too, was extremely beautiful, with its long, thin, thoroughbred lines, its mixture of rich colours, ebony black, mahogany red, shining silver, its immense blue eyes and its enormous red ears, bordered in black, in continuous nervous movement.

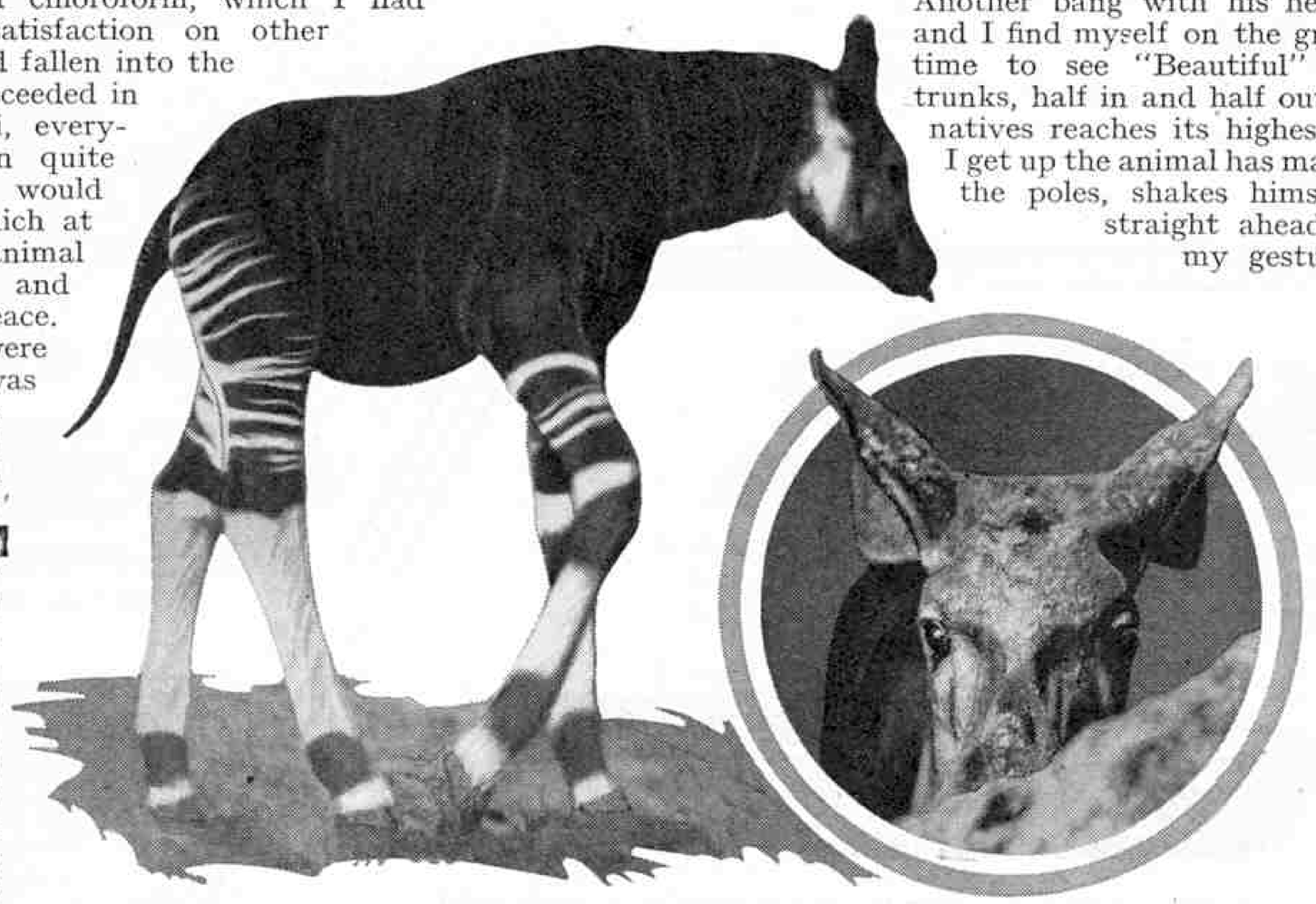
Seen from so near that head made a strange impression because of the unusual distance between the line of the ears and of the eyes, and because of a large ridge or bump between those lines. I thought at the moment that this bump had been occasioned by the behaviour of the animal in the hole, for at my arrival he was continually jerking his head up and butting the sides of the pit, alternating this performance with a series of vigorous kicks. But a

few hours later I was to learn to my cost exactly what the bump was that had called forth my sympathy.

Accustomed as I have been for three-quarters of my life to dealing with horses, I began to talk to the big okapi at my feet in a monotonous and soothing tone, and strangely he seemed responsive, little by little quieting down. As long as I talked to him and called him by name—"Beautiful" was the name it occurred to me to give him—he not only remained quiet but allowed me to stroke his back with a long leafy branch as if he understood that I was driving away the flies that had gathered in clouds. But responsive as he was, I was thinking that the problem of getting him out of that narrow hole without hurting him with ropes, and then transporting him to the base camp tied on a stretcher without making him too nervous, was going to be a difficult job. This problem naturally I had previously studied and solved theoretically. How theoretically, I could realise only then.

In preparation for a capture I had brought with me three anæsthetics, two German specialties, one to be given by mouth mixed with water, the other by injection into the corvical vein, and some old-fashioned chloroform, which I had already tested with satisfaction on other smaller animals that had fallen into the pits. If I could have succeeded in anæsthetising the okapi, everything would have been quite simple. The men then would have lost their fear, which at every movement of the animal made them run away, and could have worked in peace. Once the stretcher they were constructing near by was ready, we could have lifted the okapi out of the pit and tied him firmly on the stretcher in such a way that when we reached the palisade I should only have had to cut a rope to free him.

I soon found that my solution was not so good in practice as in theory, however, and the only result of two hours of various efforts was that I had managed to pass a rope around the okapi's neck, taking advantage of a moment when it seemed that the anæsthetic was taking effect. But at the end of those two hours "Beautiful" was more awake than before, and only I half-stupefied by the vapours of the chloroform. So I lost every hope of transporting him that day, and decided to build around the pit a strong palisade in which to leave him for some days until he could become a little tame and permit me to take him down to the base camp.



The photograph of a young Okapi on the left shows well the beautiful characteristic markings. In the circle on the right is seen an adult Okapi looking out of the pit in which he has been captured. His size may be gauged from the fact that his head reaches nearly to the top of the pit, a distance of 11 ft. The long, thin thoroughbred lines of the head accentuate the enormous ears.

The enthusiasm of my hundred men, who had meanwhile arrived, quickly oozed away during the alternations of storms and sun under which we worked to build the palisade, and was replaced by utter discouragement when, in the middle of the night, we set to work to prepare an exit for "Beautiful," and began to dig away the ground before the hole. The okapi at first grew violent. All those odours, our lights, those picks working under his nose, offended his delicate senses. But as time passed he seemed to realise that so much agitation was taking place in order to free him from that prison in which he had had to remain for 24 hours in relative immobility, mired down in sticky mud, an ordeal for an animal of such a wandering and scrupulously clean disposition. He began to follow the progress of the excavation with so much interest that he made no objection to my stroking his head.

The night passed and the first light of dawn found us still at work, or rather it found me at work tired, wet with perspiration, plastered with mud, digging away at the last wall of earth that separated our excavation from the pit. As for the men, good as they were, they had refused to work so near the okapi, and clustered outside the palisade they favoured me continually with suggestions that I should run away, for certainly at any moment the animal would jump on me—a prospect that seemed to be at the time absurd. But on that point also I soon had to revise my opinion.

Two hours later, having at last finished the job and even freed with a stick the front legs of the okapi from the thick mud imprisoning them, I express to him very clearly my opinion that if he wants to he can now come out. I climb over the palisade with the most energetic "Come on!" that my respiration will allow, and "Beautiful," as if in answer, begins to move, makes a first effort to get out of the pit. "Come on!" I shout again. He snorts, makes another try, and in two jumps is out of the *zemu*, while I climb down quickly and run to the spot where I have left my camera.

A great shouting comes down from the trees on which, as so many monkeys, my men have settled, and I turn my head just in time to see "Beautiful" galloping straight towards the point where I climbed over the palisade. Doesn't he see the palisade, those big trunks 15 or 16 in. in diameter, firmly tied together? He sees it only too well. A crack, two poles snapped in two, and the okapi's head appears in the breech. What I had supposed to be a bump is a thick bony plate as hard as steel, and what effects it can produce I began to see with my own eyes.

The shouts of the natives increase, exciting the okapi even more, and with a quick turn he gives a kick of a totally unexpected power, wheels again and charges with lowered head. Forgetting the camera I jump to the palisade just in front of him, waving my arms and yelling to the natives to keep quiet. A maddened horse, or even a buffalo in fury, would have deviated. But not the okapi.

Another bang with his head, other poles cracking, and I find myself on the ground 10 ft. away, just in time to see "Beautiful" squeezed between two trunks, half in and half out, while the racket of the natives reaches its highest diapason. By the time I get up the animal has managed to slip out between the poles, shakes himself and starts galloping straight ahead, indifferent to me and my gestures. I throw myself at the rope that is still tied around his neck, but I miss it, and between this and the push he gives me as he passes I fall again into the mud, and the animal with his slow gallop disappears into the thick undergrowth.

Even at that moment, winded as I am, and furious with my natives, who are still stupidly shouting in the tops of the trees, I find time to marvel at the extraordinary metamorphosis that has taken place in "Beautiful." No longer the sensitive, delicate head, the gentle, intelligent eyes, the huge ears pointed forward so alertly of the "Beautiful" who seemed to listen to my words. The animal who has charged, who has passed so near me and has gone, is another creature. His head stretched forward with the ears laid back assumes a completely different aspect; has even a likeness to the head of a rhino. The eyes have become glassy and cruel, the whole expression altered to that of a stupid, brutal force intent only on its one obstinate determination to get away at any cost and in spite of every obstacle.

However, not all my boys are cowards of the same calibre; and when a few minutes later they have descended from the trees and I have expressed to them my feelings in the most carefully selected insults I could find in their language, two of the best, Lumaleso and Kunabo, come to me.

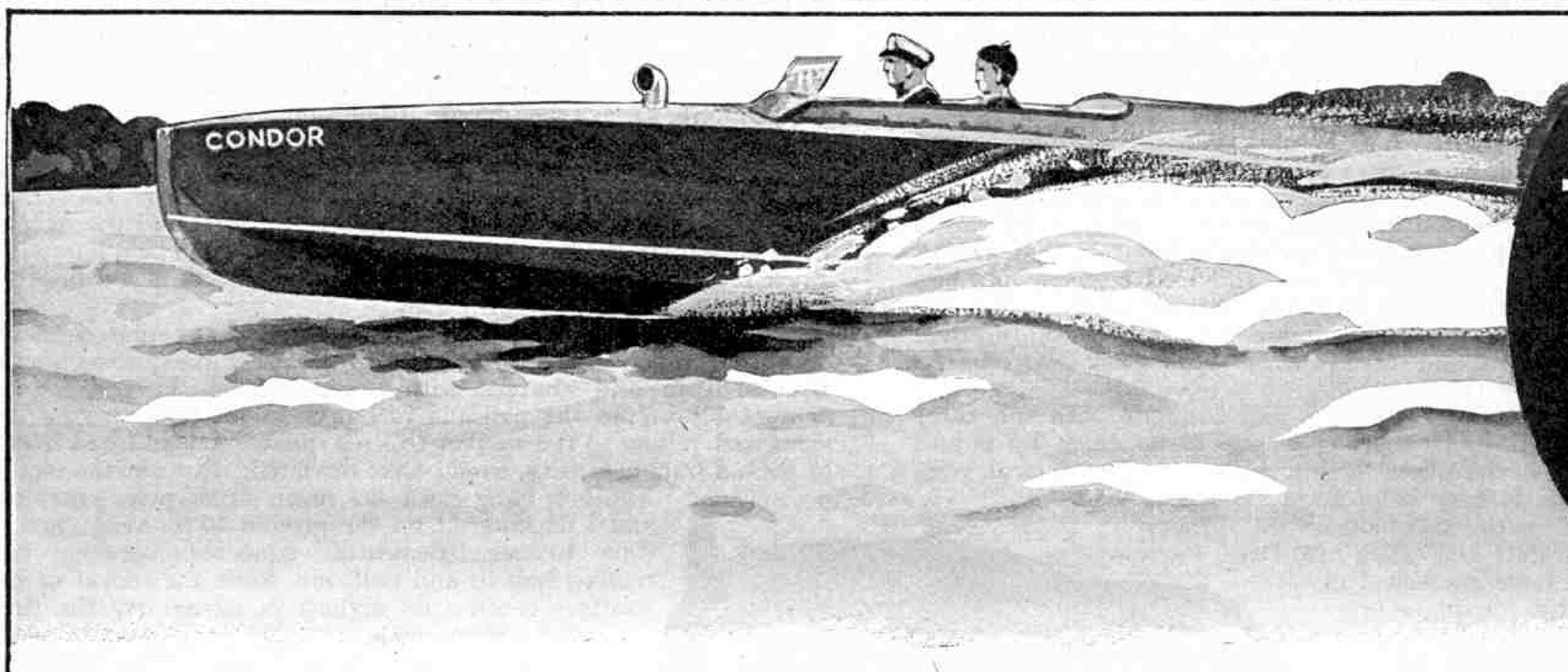
"Wait a little, *Bwana*," one of them says, and both disappear on the trail of the okapi.

The others animatedly discuss the matter between themselves. Then, "Wait a little, *Bwana*," repeats the oldest. A new burst of enthusiasm propels them all on the tracks of the other two.

Left alone, I too followed the tracks of the okapi, carefully spared by the feet of my men, to the big river where I had anticipated he would go to drink. But when I reached it I saw that the bottom was muddy at that point and therefore, judging by the traces, "Beautiful," fastidious to excess as are all okapis, had gone to find a cleaner stream in the crystalline water of which to cleanse himself from all the mud that covered him. I had nearly reached a small stream when Kunabo appeared with a beaming face. Without a word, but with a few clear gestures, he informed me that the okapi had been recaptured and tied up. And as I looked in the direction he indicated I heard the almost imperceptible sound of grinding teeth, which is the noise the okapi makes when he is irritated or in danger.

"Beautiful!" I called.

My voice was answered by a crash of leaves and branches, and a dozen natives whose presence near me I had *(Continued on page 316)*



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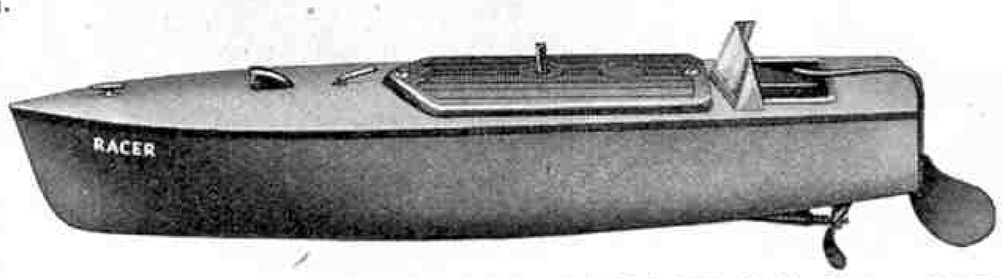

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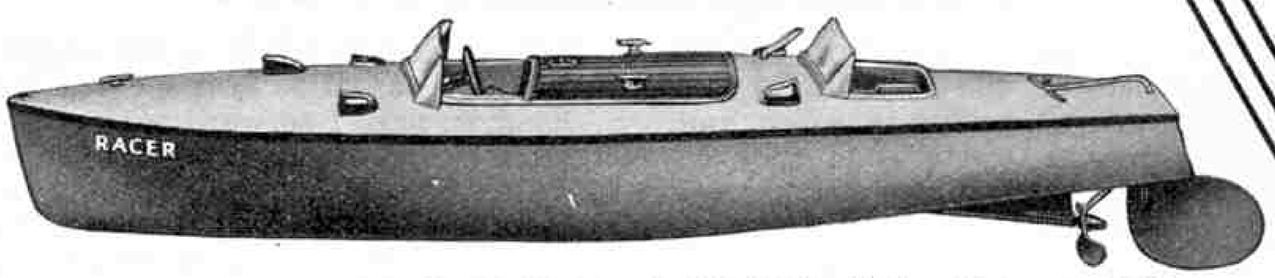

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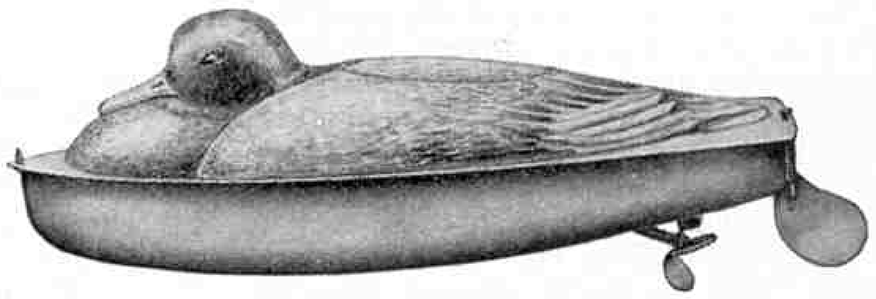

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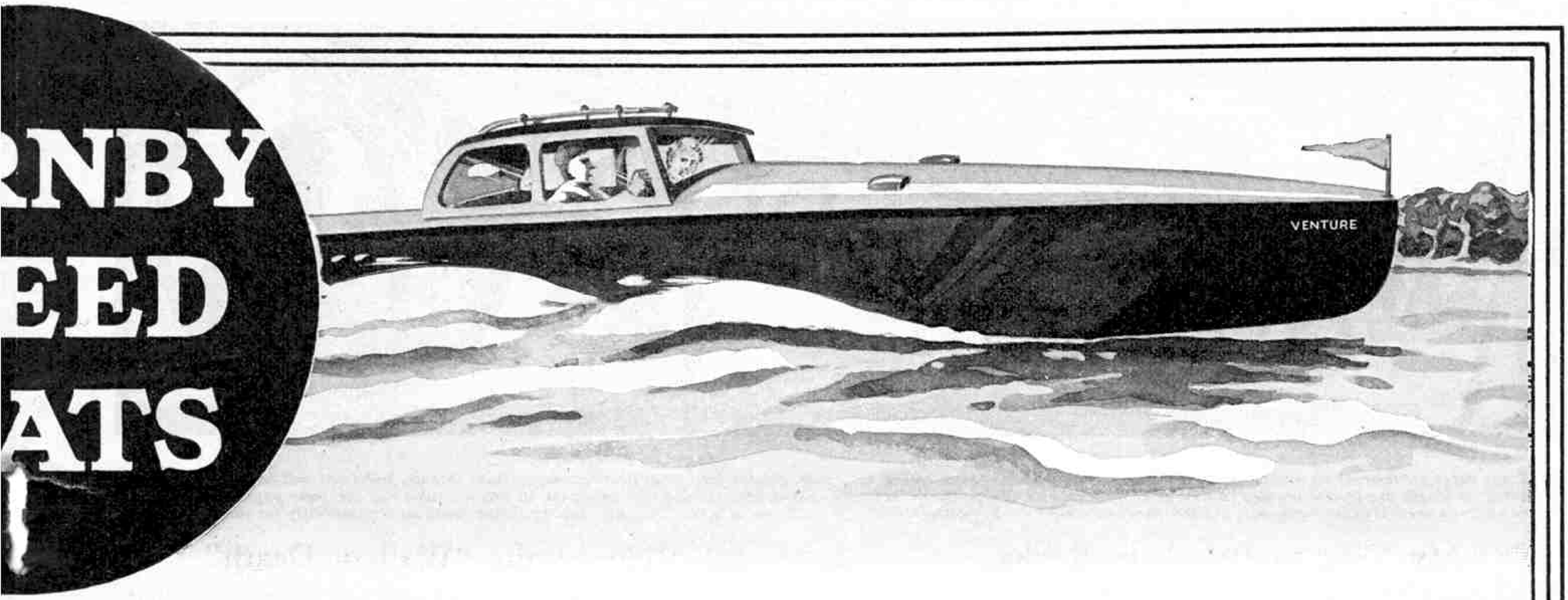

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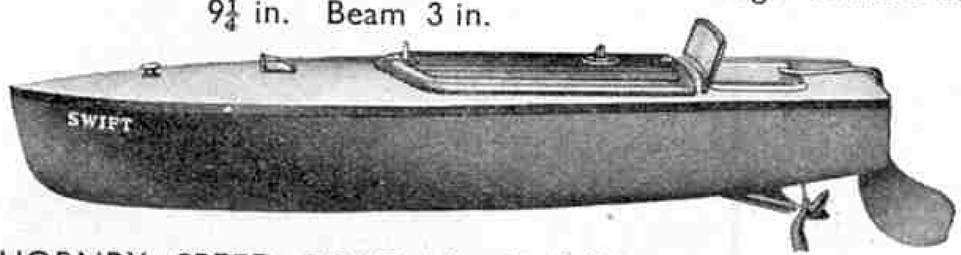

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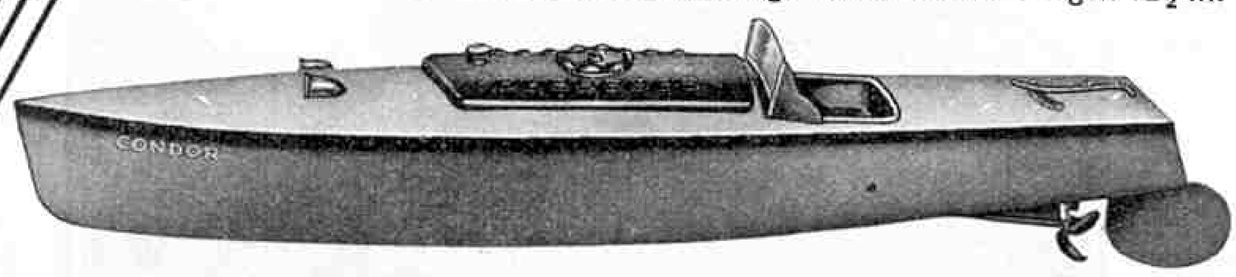

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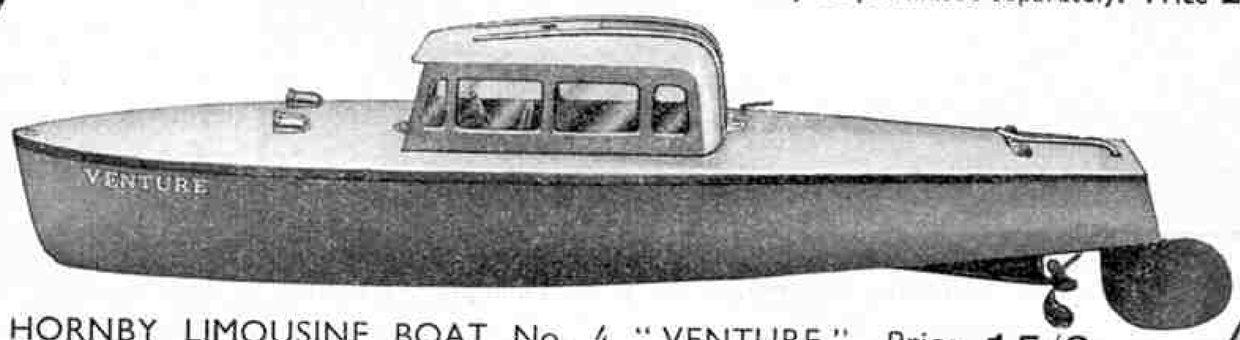

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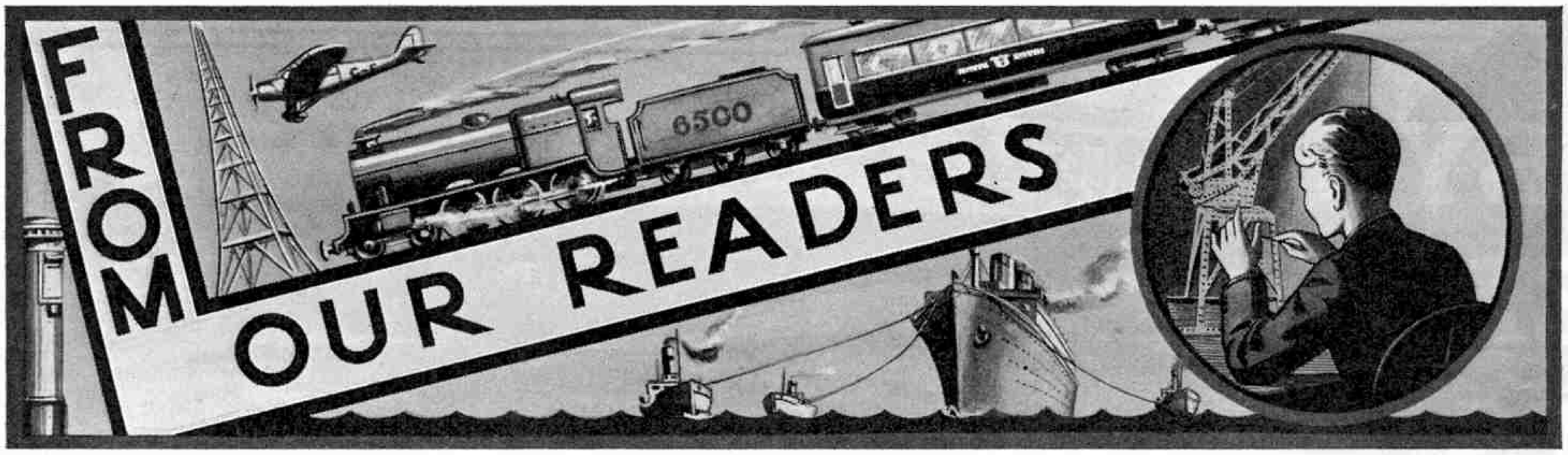


These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

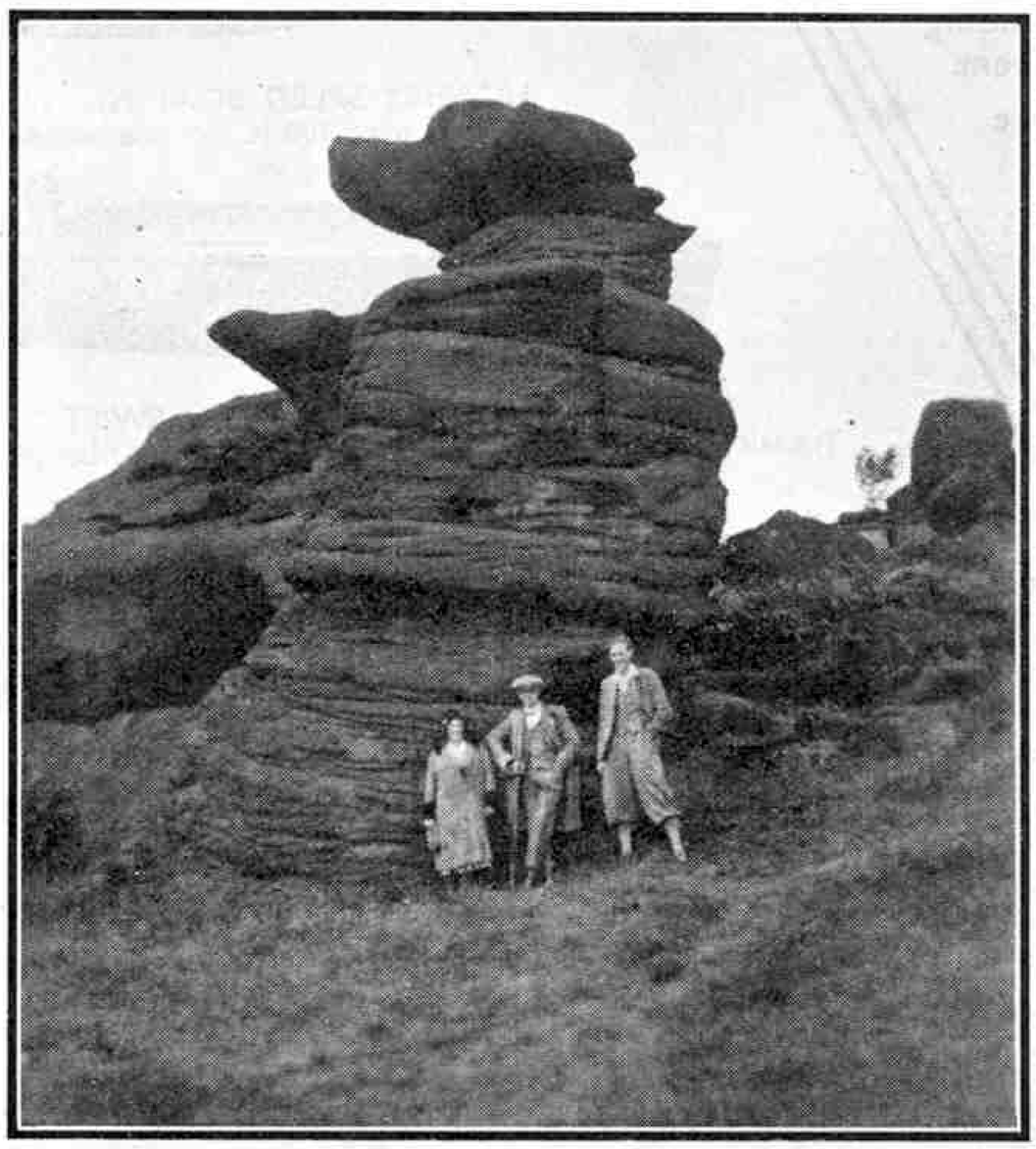
My Visit to Brimham Rocks

Few natural features of the British Isles are as remarkable as Brimham Rocks, near Pateley Bridge, in Yorkshire. There some 60 acres of ground are occupied by huge rocks, some of them weighing hundreds of tons, that are scattered about irregularly in confused piles. These rocks have been carved into fantastic shapes by wind, rain and frost, and imagination has run riot in naming them in accordance with fanciful resemblances. Four of them are rocking stones, and are so finely balanced that they can be moved to and fro on their pivots with great ease. One of these is estimated to weigh more than 100 tons and is very high, but the effort to reach its summit is well worth while because of the wonderful view that can be obtained.

Among the stones remarkable for their strange shapes is the Mushroom Rock, the form of which is suggested by its name. Another is known as the Baboon Rock because of its supposed resemblance to the head of an ape, and weighs more than 40 tons. A great mass called the Druid's Pulpit, 50 ft. in height, has on its summit a little circular stone that is supposed to represent the Parson's Head and near it is a split rock resembling a yoke of headless oxen, and a great stone known as the Rhinoceros Head Rock.

The photograph reproduced on this page shows Dancing Bear Rock, and from the point of view chosen when taking it the resemblance suggested by the name certainly is very striking. There are many other stones that mimic natural forms with more or less accuracy, but perhaps the most wonderful of all is the Druid's Idol, a gigantic rock more than 200 tons in weight, shaped like an urn and resting on a base only 1 ft. in width. Although its base is so tiny, this rock is so solidly planted that it seems likely to remain unmoved for centuries.

J. C. THOMPSON (Keighley).



The Dancing Bear Rock, one of the strangely shaped stones at Brimham Rocks, near Pateley Bridge, Yorkshire. Photograph by J. C. Thompson, Keighley.

A Ride on the "Wall of Death"

Recently I had the thrilling experience of a ride on what is known as the "Wall of Death," a circular vertical wall on which motor cycles and small cars are driven at high speed. I waited for my turn in the shadow of the giant wooden wall, and the roar of high powered motor cycles on it was scarcely soothing to my nerves, especially as it was combined with the shriek of sirens from other shows in the fairground. At last I was called for, and I climbed gingerly on a ledge, fixed on the side of a midget racing car, that usually was occupied by a lion, but I certainly did not feel as bold and majestic as the customary occupant of this position is supposed to be!

There was a sudden roar and we were off. The car rapidly mounted the wall and at first I could think of nothing except clinging to the side of the car. The peculiar sense of dizziness gradually disappeared, however, and I realised that I was being held down in my seat, in spite of the angle it made with the ground, as if some giant hand were pressing on the back of my neck. My weight seemed to have increased three-fold and it required a great physical effort to enable me to lift my head.

Gradually I began to feel the thrill of rushing round the vertical wall at more than 60 m.p.h. The driver stared straight ahead and never moved a muscle. I followed his example, for my efforts to look up or down seemed to disturb my senses, which were now adjusted to the strange motion, and to make vision very indistinct. At last we began to descend, and to my horror the car seemed on the point of overturning as we negotiated the steep gradient between the walls and the floor. When at last I stepped off the car and again stood on solid ground, I staggered like a drunken man for a moment, to the great amusement of the rider and spectators, and in this undignified manner ended the greatest thrill of my life.

D. C. A. LAVERACK (Selby).

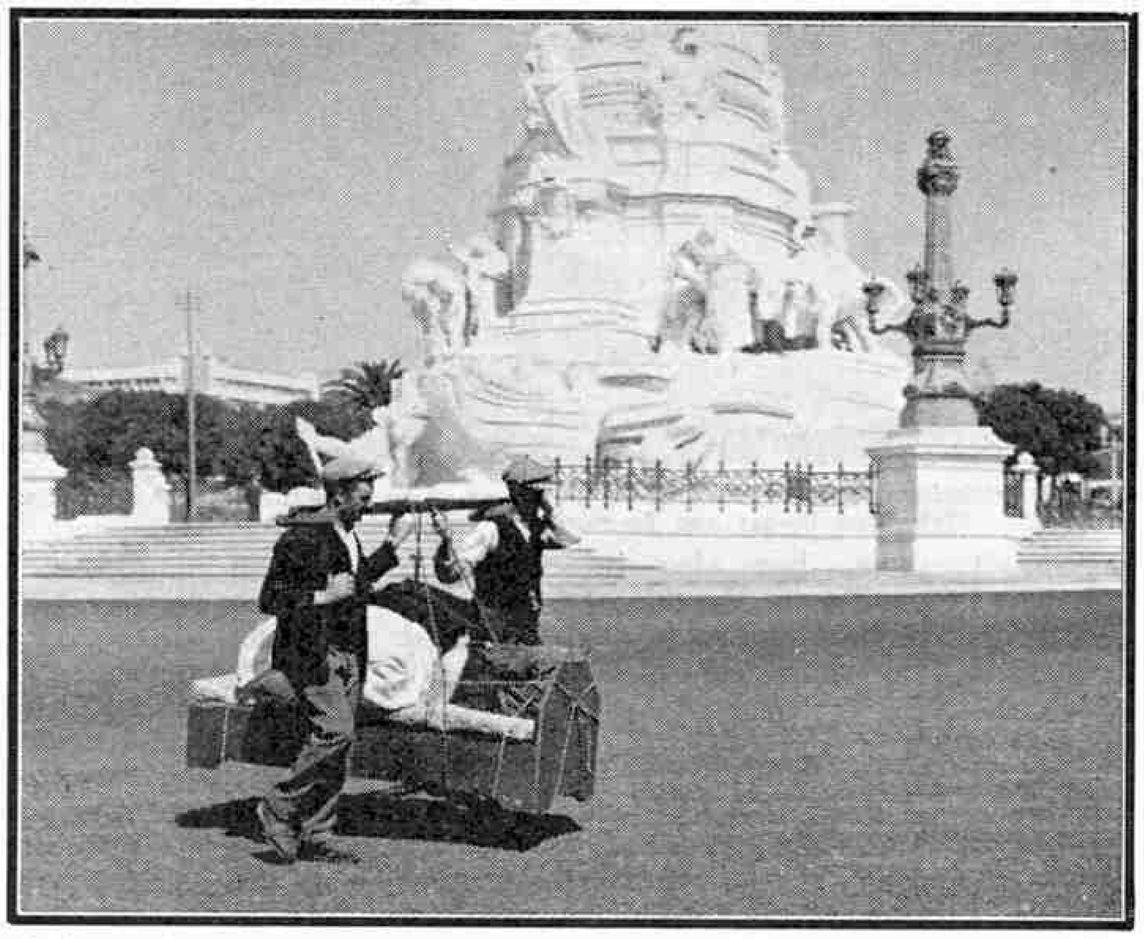
Street Scenes in Lisbon

While on a recent visit to Lisbon I was greatly interested in the water seller's cart shown in the upper illustration on this page. In British homes water taps are so familiar that one scarcely gives them a second thought, and only in severe drought, such as that experienced last summer, do we appreciate water at its true value. Some of those who live in certain other countries are not so fortunate, and this water seller of Lisbon is a welcome visitor when he makes his appearance in the suburbs with his small barrels, filled at public fountains. He is a native of Lisbon and has been selling water since he was a boy, and will continue to do so until he is an old man, unless he is able to hand his round over to his son. He is a keen business man, and the customers who live at the greatest distance from the source of supply have to pay the highest prices for their water.

A water seller of Lisbon. This photograph, and the one below, are by T. Brooks, Halifax.

Another feature of street life in Lisbon that was unfamiliar to me is illustrated in the lower photograph on this page, which shows two Portuguese carrying a heavy load across one of the main squares. Enquiry revealed that they were porters. They are called "Mocos," or "Galegos," and they stand at the street corners, with ropes on their shoulders, ready to act as carriers for all who have need of them. The two whom I photographed were removing the household belongings of a resident to his new home in another part of the city.

T. Brooks (Halifax).



A characteristic street scene in Lisbon. Porters carrying a heavy load of furniture and household goods across one of the main squares of the city.

Erecting a Giant Petrol Tank

When the Shell Mex Co. Ltd. erected the tanks of their installation at East London, South Africa, the method of construction was explained to me by the engineer in charge. Each of the two largest tanks has an internal diameter of 98 ft. 6 in. and a height of 35 ft., and holds 1,750,000 gallons. Petrol is stored in one tank and paraffin in the other, and I was particularly interested in the erection of one of these gigantic structures.

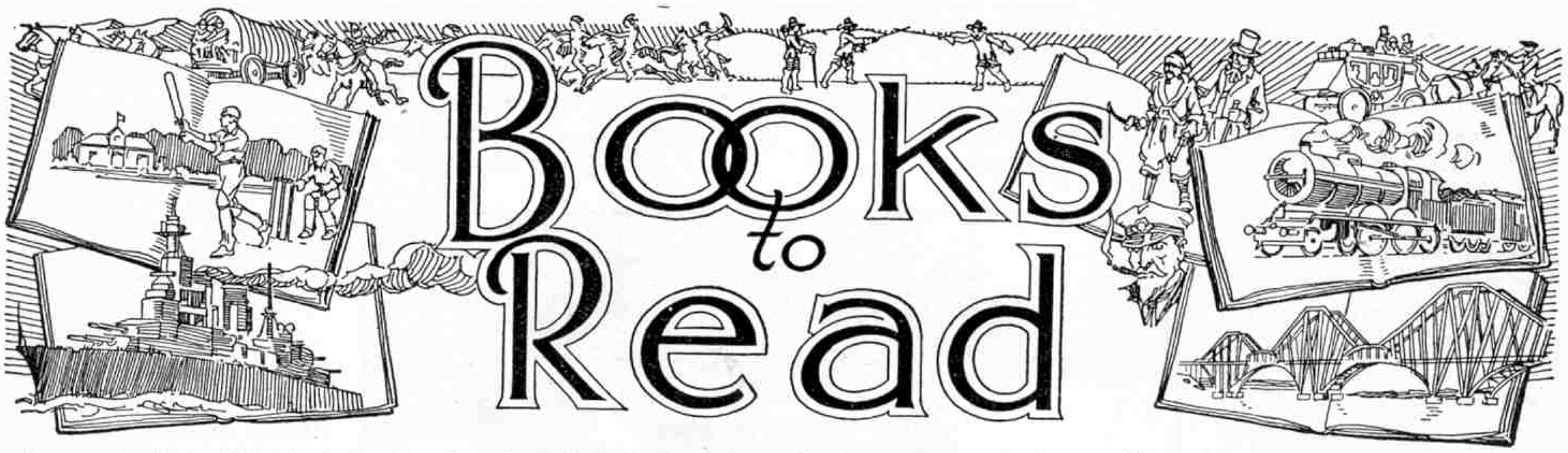
All the plates required were cut to shape, rolled to a curve when necessary, drilled for riveting, and numbered. The bottom of the tank was assembled first, and the plates were bolted to an angle ring round the rim. The whole was then raised by means of hydraulic jacks on to trestles composed of old sleepers and the necessary riveting was completed, after which the first course of side plates was placed in position. This section of the tank was then filled with water to a depth of 18 in. in order to test it for leaks, and when it had been passed as watertight the trestles were removed and it was lowered on to a bed of sand. The water was pumped out before the remaining side courses were erected and bolted, and when these were in position and had been riveted the tank was filled with water to undergo a further test.

When the engineers were satisfied that there was no leakage the testing water was pumped out and the assembly of the roof begun. This work was carried out on the floor of the tank. The steel trusses were first riveted in position and the framework then was covered with plates. The roof is of the floating type and the junction between its edges and the sides of the tank was made proof against evaporation by a special joint of asbestos packing. The roof also had to be tested for leakage, and for this purpose the tank was filled with water and air was pumped in at a pressure of 30 lb. per sq. in. The tank was left for a week, and the pressure again measured, with satisfactory results.

After the tank had been emptied the floor was covered with a cement mixture and the sides were painted with a petrol-resisting compound. Valves were fixed in the roof and sides, the pipe lines were connected, and an indicator to show the depth of the petrol in the tank was attached. Finally the outside was given a coat of red lead, followed by two coats of white paint.

As the roof of a tank of this kind actually floats on the petrol, there is no loss due to excessive vaporisation inside the tank, and of course no gas or liquid escapes through the joint. The engineer informed me that in practice there is no loss whatever, except that which takes place when the inspection covers are opened for the purpose of taking "dippings" when it is necessary to find the specific gravity of the petrol or to carry out other tests.

S. Franklin (East London).



Here we review books of interest and of use to readers of the "M.M." We can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Binns Road, Liverpool 13, adding 1/- for postage to the price. Postage on different books vary, but any balance remaining will be refunded.

"Television To-day and To-morrow"

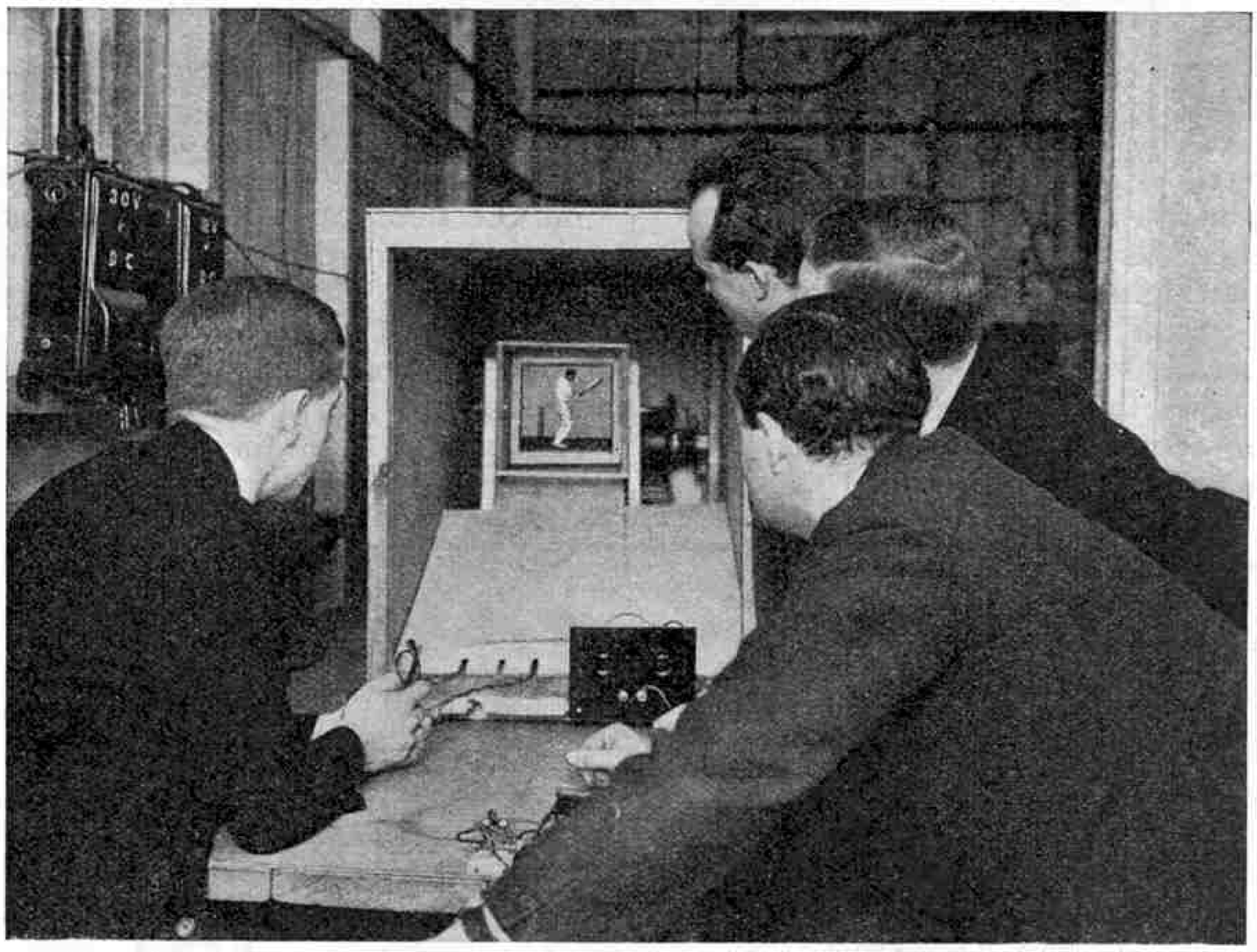
By S. A. Moseley and H. J. B. Chapple, B.Sc., A.M.I.E.E. (Pitman. 7/6 net)

The publication of the report of the Committee appointed by the Postmaster-General to consider the best means of introducing a national television system, and the probability that television programmes will be available next winter, has made the subject of television generally one of great importance. There will be many who wish to understand the working of this new marvel, and others who will be attracted to experimental work; and to both this book will be of interest. It made its first appearance in 1930, when it was reviewed in the "*M.M.*," and it has been revised and brought up to date in successive editions, of which the present volume is the fourth.

The greater part of the book is occupied by the story of television in pioneer days, and traces its development, chiefly by Mr. J. L. Baird, the famous British inventor, to the stage of public demonstration and regular television broadcasts on a limited scale. There is a wealth of practical detail, including not only the actual control of the transmitters and receivers dealt with, but also the building of efficient wireless receivers for television purposes; and anybody who reads through this part of the book will have a very clear idea of the principles involved.

The book contains also new matter dealing with more modern developments, in which the cathode ray tube and ultra short wave play a very important part. There seems little doubt that the introduction of these new methods will revolutionise television, and for this reason it is disappointing to find that only a single short chapter of 18 pages is devoted to them. This is followed by a rather meagre account of interesting developments in other countries, and the general result is that the book is excellent as an account of the television of yesterday, but scarcely justifies its title in regard to the television of to-morrow, or even of to-day.

A praiseworthy feature is the number of excellent illustrations. There are 73 plates, together with 56 drawings and diagrams in the text. These show not only apparatus used in various branches of television, such as the Baird tele-cine transmitter illustrated on the opposite page, but also interesting scenes and events in the history of television, such as the successful experimental reception shown on this page.



Watching a famous cricketer's stroke reproduced on the screen of an experimental television receiver. (From "Television To-day and To-morrow," reviewed on this page.)

Brown's Nautical Almanac

(Brown, Son & Ferguson Ltd. 3/- net)

With the 1935 edition this well-known almanac reaches its 58th year of publication. Many of the regular features, such as the tide tables, tidal constants and list of lights, buoys and beacons, have been extended. Several important new tables have been added, and a new section headed "Port Information" gives particulars of pilotage regulations for British ports. The section on "Nautical Meteorology" contains interesting and useful articles on such subjects as the barometer at sea, tropical revolving storms, ocean currents, trade winds, and how to make weather charts.

"Practical Hints to Scoutmasters"

By Rev. R. P. Cheesman, M.A., and L. G. Atrill

"The Group Scoutmaster"

By A. R. Ellis

(Brown, Son & Ferguson. 1/6 each net)

These recent additions to the excellent Scouting books issued by the publishers are written by experts with long experience of the form of Scout work with which they deal.

The first is a general guide covering the whole range of a Scoutmaster's work from enrolling recruits to organising the work of a fully-fledged Scout troop. Discipline, training, the formation of a band, and the organisation of a camp and other annual events are fully dealt with, and the fact that the book is now in its fourth edition is evidence of its practical value.

Mr. Ellis has compiled an excellent guide to the work of the Group Scoutmaster, a rank that was officially brought into existence seven years ago. It is based on actual work in the rank dealt with, and any Group Scoutmaster who studies it in detail, and adapts its principles as far as possible to his circumstances, will maintain the right spirit among those in charge of the Rovers, Scouts and Cubs composing his Group.

"The Out-of-Doors Book"

By Arthur Stanley. (Dent. 6/- net)

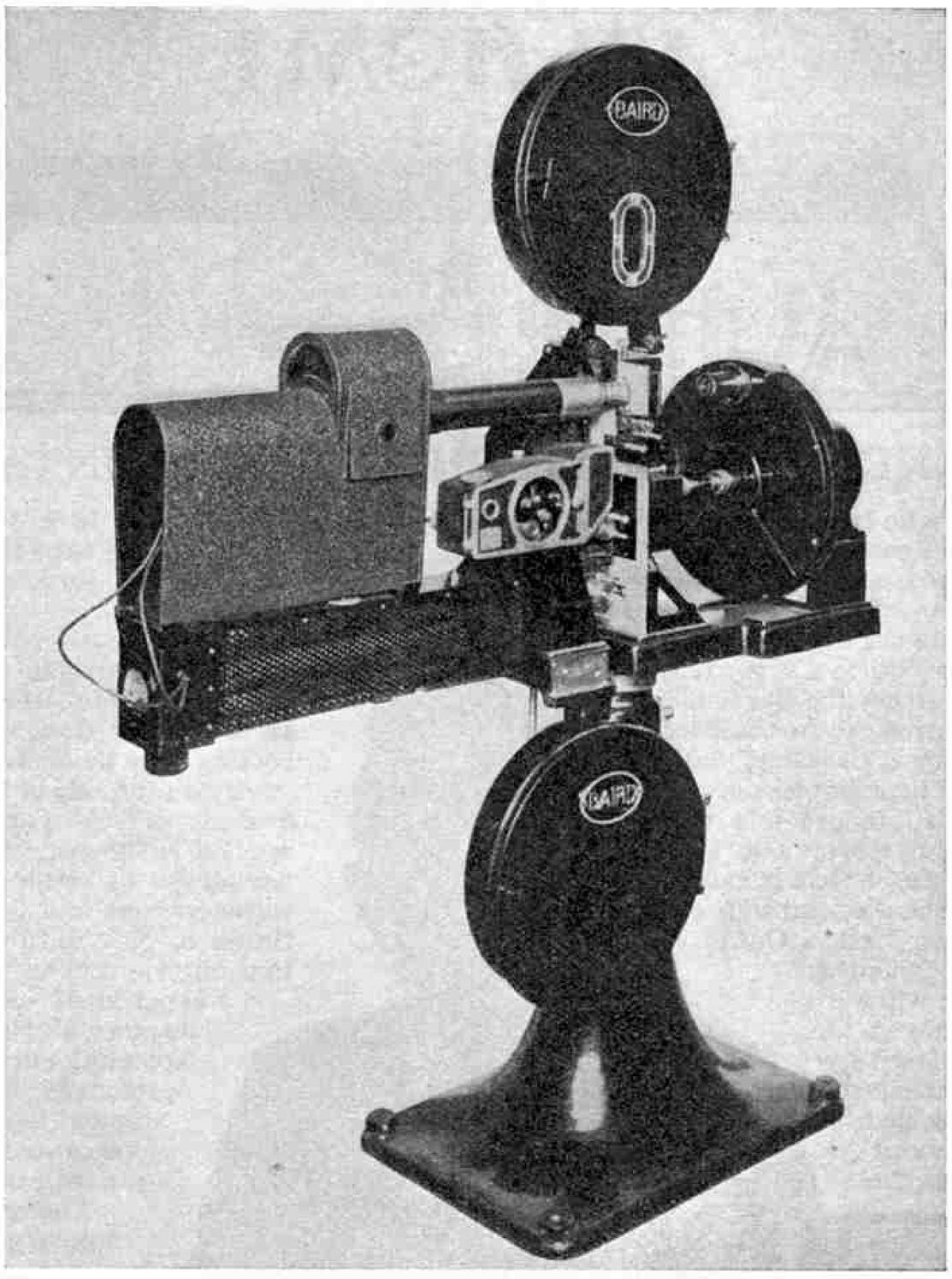
Mr. Stanley's previous efforts in the production of anthologies gave one high expectations in regard to this volume, and these are fully justified. In his foreword the author says: "My aim is to be a friendly companion (either within doors or without) of all who are attracted by open-air life and its associations"; and in this aim he certainly has succeeded. The book contains a most interesting and delightful collection of extracts from a great variety of authors, all dealing with some aspect of our roads and lanes, meadows and rivers, downs and woodlands, ancient villages, and the sea. Some of the items are serious, others light and humorous; but all are good. This is a book to pick up at odd moments in the full confidence of finding something good.

"Through Space and Time"

By Sir JAMES JEANS
(Cambridge University Press. 8/6 net)

Sir James Jeans has won a great reputation by his gift of explaining simply, but at the same time fully and accurately, the wonderful achievements of modern astronomy; and he has fully maintained it in the present book, which contains a course of lectures delivered by him during the Christmas season of 1933–34 at the Royal Institution. In the quaint phrase adopted by the Institution, this course was to be in a style "adapted to a juvenile auditory." Sir James points out that in practice this means that the lecturer will be confronted with an "eager and critical audience, ranging in respect of age from eight to eighty, each of whom will expect the lecturer to say something that will interest him." There is no doubt that every member of this audience would be amply rewarded, and readers of the volume reproducing the lectures will be equally satisfied.

The journey through time and space is described by the author as the longest in the whole Universe. It is an imaginary one, of course, and we begin by travelling to the North Pole, to look down on the Earth and learn something of its size and shape. We bore deeply into its interior with the aid of earthquake waves, the scientist's drill, and read the story written in the rocks to trace its life history from the time when it cooled sufficiently to begin solidification. This section of our journey occupies nearly 2,000 million years, but Man himself is directly concerned only with the last million years of it.



View of one of the Baird high-definition transmitter for the television of cinematograph films on ultra-short waves. (See opposite page.)

We are then taken upward from the Earth into the atmosphere, where we learn something of the mysteries of the stratosphere, the section above seven miles from the Earth's surface in which we find the Heaviside layer, the Appleton layer, and other regions from which wireless waves are reflected. Beyond these is the sky, the Sun and the planets, the Moon and the stars. The distances to be traversed if we are to reach these bodies are so immense that we must travel in a rocket with a speed of at least seven miles a second, and even then it will take us two days to reach the Moon. In this rocket we explore the entire solar system with Sir James, first visiting the Moon, the dead world that rotates around the Earth, where we must take our own oxygen with us if we wish to climb its mountains and explore its mysterious crators. Then we pass on to the planets before we come to the Sun, an incandescent mass of gas shooting out from its surface immense flames in which the Earth itself would appear to be a mere spot. Little by little we are solving the mysteries of this giant star. We know something of the chemical elements contained in it, and of their condition, and we are aware that the temperature at its centre must be from 40 to 50 million degrees F. A pin head of matter at this temperature would give out radiation with as much energy as an engine of about 3,000 million h.p., and this would be sufficient to shrivel up any man who ventured within a thousand miles of its source!

A comet that appeared in 1908. The short lines are elongated star images and many of them are visible through the comet's tail. (From "Through Space and Time," reviewed on this page.)

Proceeding farther in search of the stars, the first thing we realise is that they are very widely scattered. In order to illustrate the comparative emptiness of space, Sir James suggests as a model a cage 1,000 miles long, 1,000 miles broad and 1,000 miles high, with only six wasps flying blindly about inside it; and if the wasps are to represent stars they must be slowed down until they move at about one-hundredth part of a snail's pace. A further illustration is given by the fact that Sirius, the brightest star in the sky, is 51 million million miles away, although only one of the 5,000 stars visible without a telescope is nearer to us.

The majority of the stars that we see in our journey are fainter than the Sun, but some are immensely brighter. The brightest of all gives out so much radiation that if it were suddenly to replace our Sun we should be roasted in a fraction of a minute, and the entire Earth would be turned into vapour in a few hours! Other astonishing details of the sizes and temperatures of the stars are given, and we learn how astronomers have recognised the shape of the vast system of which the Sun and the planets form an infinitesimal part. Finally we leave our own star system and approach the nebulae outside it. These appear to us on Earth as tiny fuzzy indefinite patches of faint light, but some are so large that our rocket would take about 90,000 years to travel through one of them. We recognise them as the birthplaces of the stars, and as they are themselves at different stages in development, some being globular masses of glowing gas and others having changed into rotating spirals studded with stars, or finally into vast star systems, they enable us to extend our imaginary journey back through time to the period, millions of years ago, when the Universe was a chaotic mass filling all space.

This brings our journey to an end, for it would take too much time to travel completely round this wonderful Universe, which seems to be expanding just as the surface of a balloon grows larger when it is blown up. Space already is so large that our largest telescope, the 100-in. reflecting instrument on Mount Wilson, in California, shows us only a tiny fraction of it, and it is continually becoming larger, doubling its dimensions every 1,300 million years or so. The author's story of our venture is a fascinating one, and its interest is greatly increased by the 53 excellent plates included in the book, which give us glimpses of the wonders to be seen in our long voyage.

MAKING A SIMPLE CHEMICAL FOUNTAIN

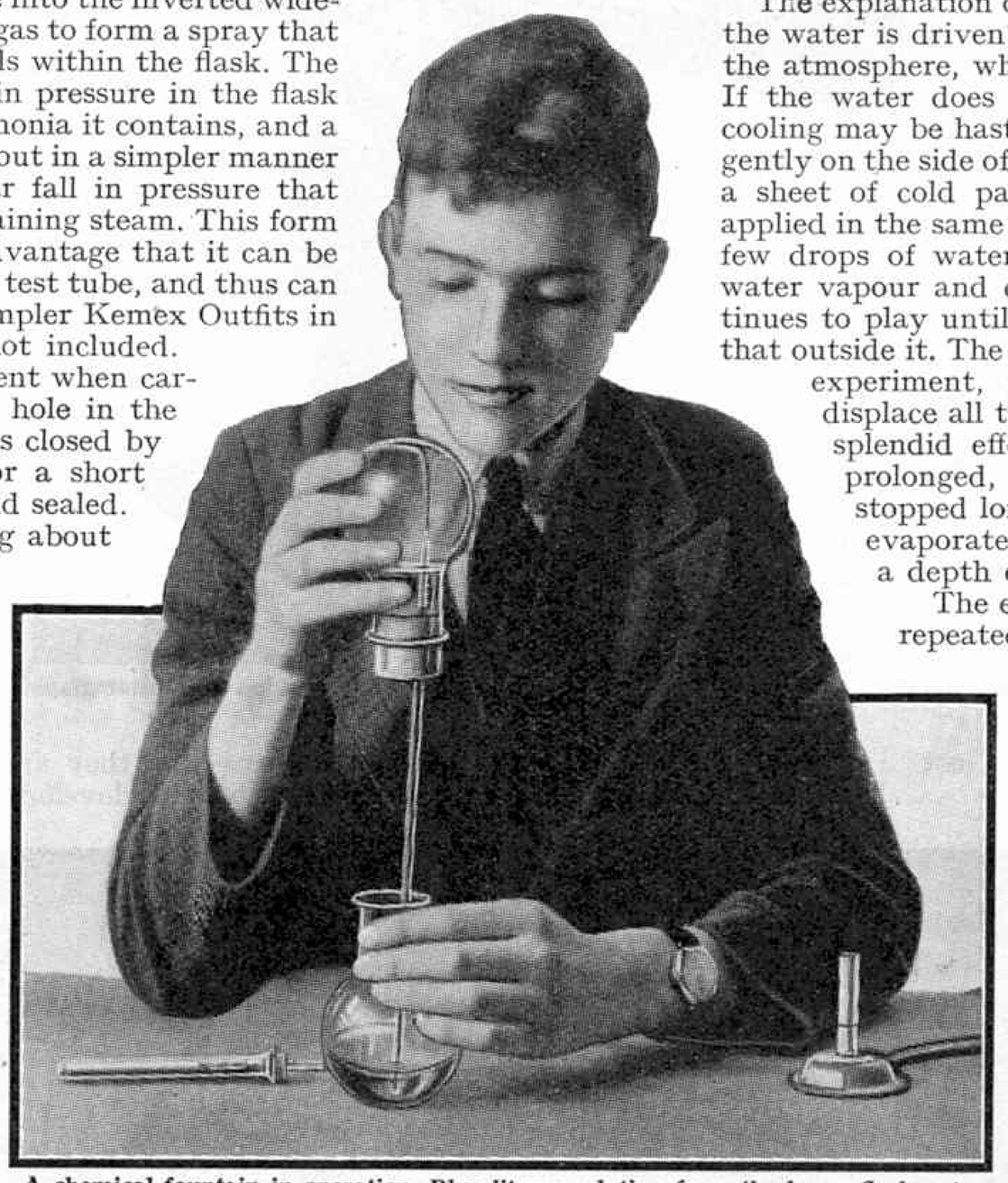
THOSE owners of Kemex Outfits who have worked through the experiments described in the 2/3 Kemex Manual will have been impressed by the spectacular ammonia fountain experiment described on page 34. In this a stream of pink liquid rises at great speed through a vertical glass tube into the inverted wide-necked flask containing ammonia gas to form a spray that changes in colour to blue as it falls within the flask. The fountain is produced by the fall in pressure in the flask caused by the solution of the ammonia it contains, and a similar experiment can be carried out in a simpler manner by taking advantage of a similar fall in pressure that follows the cooling of a flask containing steam. This form of the experiment also has the advantage that it can be carried out on a small scale with a test tube, and thus can be performed by owners of the simpler Kemex Outfits in which the wide-necked flask is not included.

In preparation for the experiment when carried out on the larger scale, one hole in the large bored cork, Part No. K17, is closed by means of a piece of glass rod or a short length of glass tubing with one end sealed. One end of a piece of glass tubing about 6 in. in length is drawn out into a jet, as explained in the Kemex Manuals, and more fully in the Kemex article on page 238 of last month's issue of the "*M.M.*"; and this is passed through the second hole in the cork, from the larger end to the inner end, so that the jet projects to the extent of about 2 in. When the cork is inserted in the wide-necked flask, the jet itself is then in the spherical portion of the vessel.

A short piece of connection tubing is then placed on the end of the glass tube outside the flask. The other requirements for the experiment are a saucer or basin containing sufficient water to fill the flask, together with the universal stand, complete with gauze square, and the Bunsen burner or spirit lamp.

Water to a depth of about $\frac{3}{4}$ in. is placed in the flask, into the neck of which the cork carrying the jet is inserted. The flask fitted up in this manner is placed on the gauze square on the universal stand, and the water in it is heated to boiling point by placing the lighted Bunsen burner or spirit lamp under it. Steam then escapes freely through the glass tube and the rubber connection tube on the end of it and the boiling is continued for about five minutes in order to make sure that as much as possible of the air in the flask is displaced. The flame below is then removed, and a fraction of a second later, just when steam ceases to issue from the flask, the connection tubing is closed by squeezing it between the thumb and the finger.

As the flask cools the steam within it condenses and a partial vacuum is formed. The flask is removed from the universal stand, a piece of cloth being used to hold it in order to avoid discomfort, and is inverted with the connection tubing at the end of the long glass tube completely immersed in the water in the basin already referred to. While this operation is being carried out, care must be taken to keep the connection tubing closed, and on releasing the pressure of the thumb and finger in order to open a passage through this, water rises up the glass tube into the wide-necked flask and rushes through the jet in the form of a fountain, as shown in the illustration on this page.



A chemical fountain in operation. Blue litmus solution from the lower flask enters the upper vessel in a spray that turns red.

The explanation of this fountain effect of course is that the water is driven up the glass tube by the pressure of the atmosphere, which is greater than that in the flask. If the water does not rise rapidly up the glass tube, cooling may be hastened by laying the palm of the hand gently on the side of the flask for a moment, or better still, a sheet of cold paper or cloth of some kind may be applied in the same manner. The entry into the flask of a few drops of water hastens the action by cooling the water vapour and condensing it, and the fountain continues to play until the pressure in the flask is equal to that outside it. The flask is never filled with water in this experiment, for it is practically impossible to displace all the air inside it by means of steam. A splendid effect is obtained when the boiling is prolonged, however, but of course this must be stopped long before all the water in the flask is evaporated. A safe rule is to leave water to a depth of at least $\frac{1}{2}$ in.

The experiment is so simple that it can be repeated with very little loss of time, for the preparations for each repetition take only a few minutes. Interest is increased by adding a few drops of dilute hydrochloric acid, or a measure of Sodium Bisulphate, Part No. K125, to the water boiled in the flask, and colouring the water in the basin blue by adding litmus solution to it. As the blue litmus solution enters the flask and mixes with the liquid already there it is turned bright pink. An equally attractive result follows the use of water coloured with Congo Red, for this undergoes the opposite change, and is turned blue on entering the flask.

Kemex enthusiasts whose outfits do not include the wide-necked flask can carry out the experiments on a smaller scale with a test tube. In this case the cork to be used has only one hole in it and it is through this that the tubing ending in the jet is passed, to project so far beyond the cork that the jet is about half way along the test tube. In this position it will be above the water in the test tube when this is inverted. Water to a depth of about an inch is boiled in the test tube, which is held in the test tube holder with its lower end in the flame; and as before, the rubber connection tubing is squeezed immediately after steam ceases to issue from it, to be opened only under water contained in a basin or some other vessel. The result is satisfactory, although not quite so spectacular as when the wide-necked flask is used, owing to the smaller volume of the vessel from which the air is displaced. Colour changes can be effected by similar means to those already explained.

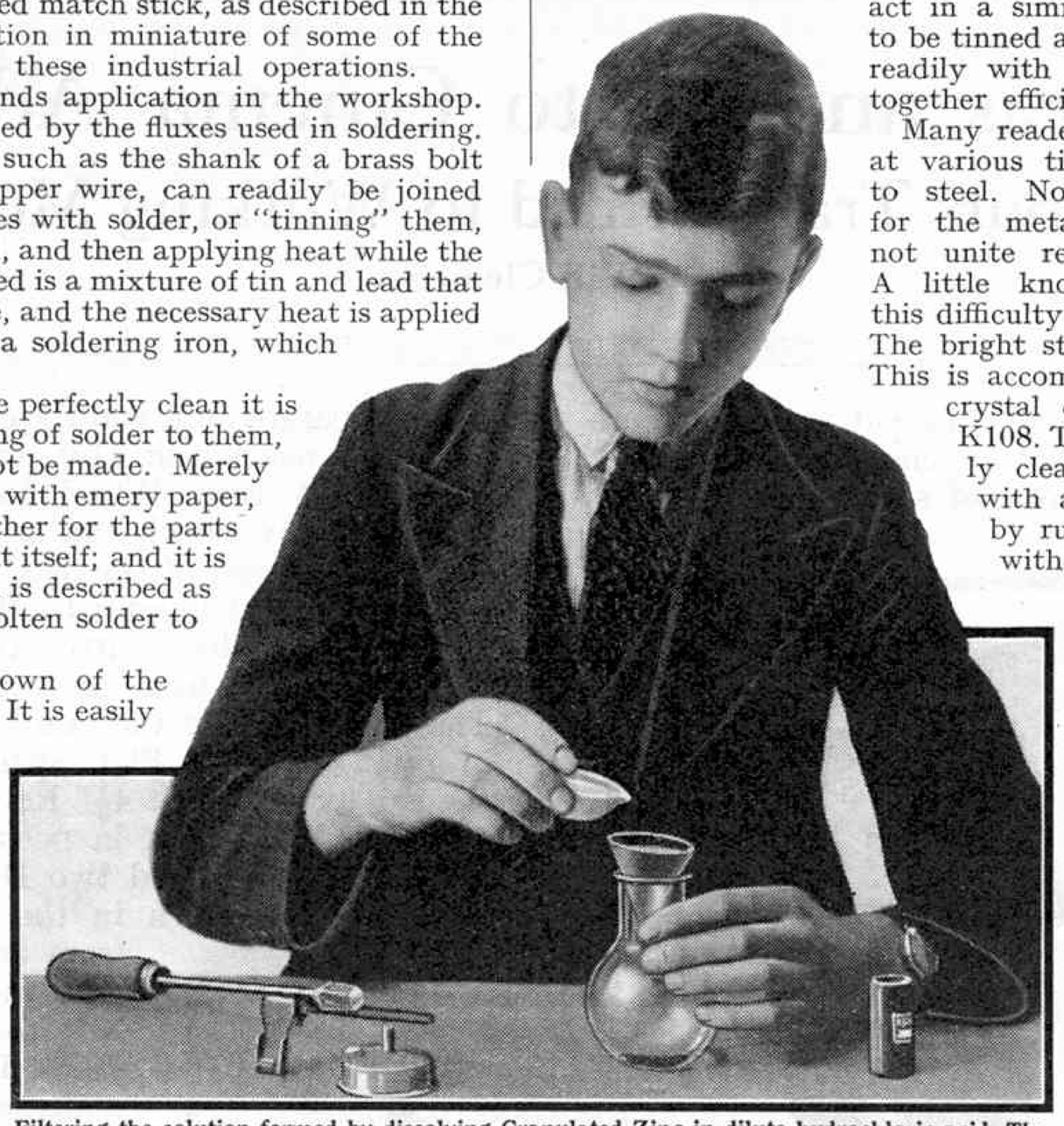
Chemistry is of great importance in engineering. It is to the chemist that the engineer owes the production of special steels and other metals of which he makes use, and the extraction of metals from their ores and their purification is brought about by means of chemical changes carried out on a large scale. The reduction of metallic compounds to metals by heating on charcoal with the aid

of the blowpipe, or on a carbonised match stick, as described in the Kemex Manuals, is a reproduction in miniature of some of the chemical changes employed in these industrial operations.

Apart from this, chemistry finds application in the workshop. An interesting example is provided by the fluxes used in soldering. Two objects of brass or copper, such as the shank of a brass bolt and the end of a length of copper wire, can readily be joined together by coating their surfaces with solder, or "tinning" them, as this operation is usually called, and then applying heat while the two are in contact. The solder used is a mixture of tin and lead that melts at a fairly low temperature, and the necessary heat is applied by means of the copper bit of a soldering iron, which is heated in a flame.

Unless objects to be tinned are perfectly clean it is difficult to apply a smooth coating of solder to them, and satisfactory joints then cannot be made. Merely washing, or even filing or rubbing with emery paper, is not altogether satisfactory, either for the parts to be united or for the copper bit itself; and it is usual to apply a chemical, which is described as a flux, in order to enable the molten solder to flow freely over them.

Zinc chloride is the best known of the chemicals used for this purpose. It is easily made by dissolving Granulated Zinc, Part No. K134, in dilute hydrochloric acid, which can be purchased in small quantities from a chemist. In order to prepare zinc chloride from this liquid, a test tube is filled with it to a depth of about 1 in. and two or three pieces of Granulated Zinc are added to it, preferably by holding the test tube at an angle and sliding them down its inner surface in order to avoid splashing the acid liquid. As effervescence soon begins. This is due to the production of the gas hydrogen, which takes fire when the mouth of the test tube is brought to a flame.

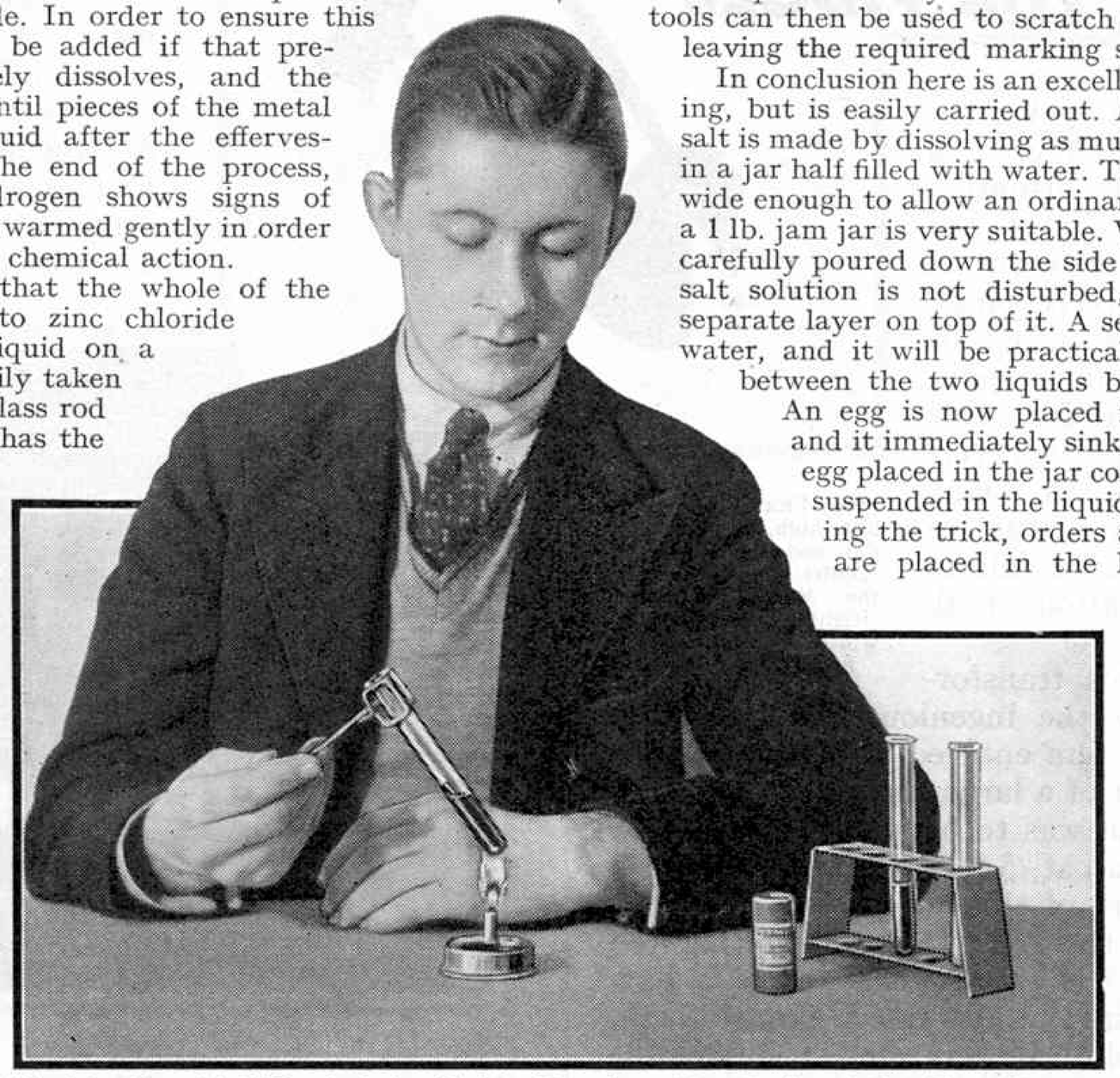


Filtering the solution formed by dissolving Granulated Zinc in dilute hydrochloric acid. The zinc chloride solution formed is a useful flux in soldering operations.

The action must be continued until the whole of the acid is neutralised, or "killed" to use the familiar workshop term, and is converted into zinc chloride. In order to ensure this more Granulated Zinc must be added if that previously introduced completely dissolves, and the process must be continued until pieces of the metal remain unaltered in the liquid after the effervescence has ceased. Towards the end of the process, when the evolution of hydrogen shows signs of dying away, the tube can be warmed gently in order to quicken up the end of the chemical action.

A further test to ensure that the whole of the acid has been converted into zinc chloride is to place a little of the liquid on a litmus paper. A drop is readily taken out by dipping the end of a glass rod into the solution, and if this has the effect of turning blue litmus red it is necessary to add more zinc.

When all the acid has been neutralised, the solution contains only zinc chloride. It must then be separated from the excess of zinc, and from impurities in the metal that have been freed by the action of the acid. This is readily accomplished by filtering, as shown in the upper illustration on this page. The solution that passes through the filter paper is neutral, and when a little of it is applied to any small object made of brass or copper it will remove impurities and ensure chemical cleanliness, with the result that solder can be melted on the surface so treated and made to flow freely. In soldering, the copper bit itself is dipped in the liquid after heating, and before the solder is applied to its surface to cover it with this alloy. Soldering fluxes of special composition act in a similar way, cleaning the surfaces to be tinned and enabling them to be covered readily with solder and thus to be joined together efficiently and easily.



Dissolving Granulated Zinc in hydrochloric acid to form zinc chloride solution. The acid must be completely neutralised, or "killed," by the action of the zinc.

Many readers no doubt have made efforts at various times to unite brass or copper to steel. Normally this is very difficult, for the metals in the soldering alloy do not unite readily with the steel surface. A little knowledge of chemistry enables this difficulty to be overcome in many cases. The bright steel is first coated with copper. This is accomplished by the use of a large crystal of Copper Sulphate, Part No. K108. The steel surface is first thoroughly cleaned and is then rubbed over with a damp cloth. This is followed by rubbing the bright steely surface with the Copper Sulphate crystal, and it is then covered with a reddish layer of copper, displaced from the Copper Sulphate by the iron, as explained in the Kemex Manuals. Copper can readily and easily be soldered, and the coating applied in the manner described adheres sufficiently well to the steel to enable it to be used as a foundation for the solder. A junction can then be made with other objects made of copper or brass, or with a second steel object coated with copper in a similar manner.

The chemical action of iron on Copper Sulphate provides a useful method of marking out hard steels, such as those used in tool making. For this purpose they are given a very thin plating of copper by the simple method already described of rubbing the damp surfaces with Copper Sulphate crystals, which in workshops are usually known as "bluestone." The usual marking tools can then be used to scratch off the copper where desired, leaving the required marking standing out clearly.

In conclusion here is an excellent trick that is very mystifying, but is easily carried out. A strong solution of common salt is made by dissolving as much of this chemical as possible in a jar half filled with water. The mouth of the jar should be wide enough to allow an ordinary egg to pass through it, and a 1 lb. jam jar is very suitable. Water is then very slowly and carefully poured down the side of the jar so that the strong salt solution is not disturbed, the water remaining as a separate layer on top of it. A second similar jar is filled with water, and it will be practically impossible to distinguish between the two liquids by mere inspection.

An egg is now placed in the jar containing water, and it immediately sinks to the bottom, but a second egg placed in the jar containing salt solution remains suspended in the liquid, half way down. In performing the trick, orders are given to the eggs as they are placed in the liquids, and they will obey faithfully if the preparations have been correctly made, but the experimenter must take care not to shake the jar in which the salt solution is contained—or to become confused between the two jars! The mystification of onlookers is increased by allowing them to take out a little liquid from the top of each jar with the aid of a spoon. On tasting both samples naturally prove to be water.

The true explanation of the difference in behaviour of the two eggs is that dissolving salt in water increases the density of the liquid. The lower layer of salt solution in one of the jars is denser than the egg, which therefore floats on its upper surface after sinking through the water above it.

Meccano as an Aid to Cinema Advertising

Cutouts Transformed to Working Models

By Will Clemence

MECCANO has been used for a great variety of purposes by scientists, inventors, engineers and others, and many interesting examples of such uses have been described from time to time in the "*M.M.*" One of the most recent applications of Meccano is in adding movement, and therefore interest, to cinema advertising displays.

All cinema-goers are familiar with the large painted wooden cutouts that are frequently displayed in the entrances and corridors of large cinema theatres. As a general rule these cutouts consist of more or less life-like representations of the most important artists taking part in the principal film or films that are to be shown during the following week. They attracted a considerable amount of attention when they were first introduced, but now that the novelty has worn off their interest is comparatively small. The greatest defect of the cutouts is obviously their lack of movement, and it is here that Meccano has come to the assistance of the cinema advertiser. By its aid cutouts are being transformed to extremely attractive working models that cannot fail to catch and hold the attention of all who see them.

(Top) Front view of cutout, 5 ft. high, advertising "The Cat and the Fiddle" film. (Centre) Rear view showing the Meccano mechanism. (Right) Another cutout, in which a Meccano-operated figure played the piano.

A good example of this transformation was provided by the ingenious mechanisation of a cutout advertising a film entitled "*The Cat and the Fiddle.*" The management of a large cinema in the north of England where the film was to be shown installed in the vestibule a figure of a cat, 5 ft. in height, holding a violin. The unusual nature of this cutout was sufficient to attract attention, but the great feature was that the figure moved. The huge cat rhythmically drew a bow across painted violin strings, while music issued forth, apparently from the violin. It was almost impossible for any person to enter the vestibule of that cinema without pausing for a moment in front of this remarkable advertisement, yet the arrangement was exceedingly simple and was due to a few Meccano parts.

The right foreleg, used as an arm to play the violin, was a separate unit, and the centre illustration shows the Meccano mechanism by which the movement was achieved. A Bush Wheel bolted to the arm carried a short Rod by which the arm was pivoted to the cat. At the other end of this Rod was a second Bush Wheel, and on this was mounted a $2\frac{1}{2}$" Strip. The upper end of the Strip was lock-nutted to a $5\frac{1}{2}$" Strip that in turn was lock-nutted to a crank consisting of a Bush Wheel. The Rod carrying the crank was mounted at one side of a $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flat Plate spaced away from the back of the cat by means of $4\frac{1}{2}"$ Reversed Angle Brackets. The crank Rod was kept in position by a bracket built up from a $2\frac{1}{2}"$ Strip and two Double Brackets, secured to the Plate as shown in the illustration. A slow drive from an electric motor placed behind the cat was transmitted by a belt to a 1" Fast Pulley on the crank Rod, and imparted a most realistic movement to the cat's arm. A loudspeaker close to the violin, but hidden from view, provided suitable music from a gramophone running in an adjoining room.

A more remarkable accomplishment of Meccano was that of persuading Joan Blondell, the famous Hollywood star, to wink! A wooden cutout showing this film actress with a companion was prepared for publicity purposes. The lively expression on their faces seemed to call for movement of some kind, and after a little scheming this was arranged as shown opposite. The eyes of Miss Blondell were deleted from the cutout and reproduced on a separate strip of wood. This strip was placed behind and very close to the eye holes, the slight gap between it and the outcut providing room for the descent of an eyelid cut out of tinplate and bolted to the end of a $12\frac{1}{2}"$ Angle Girder.

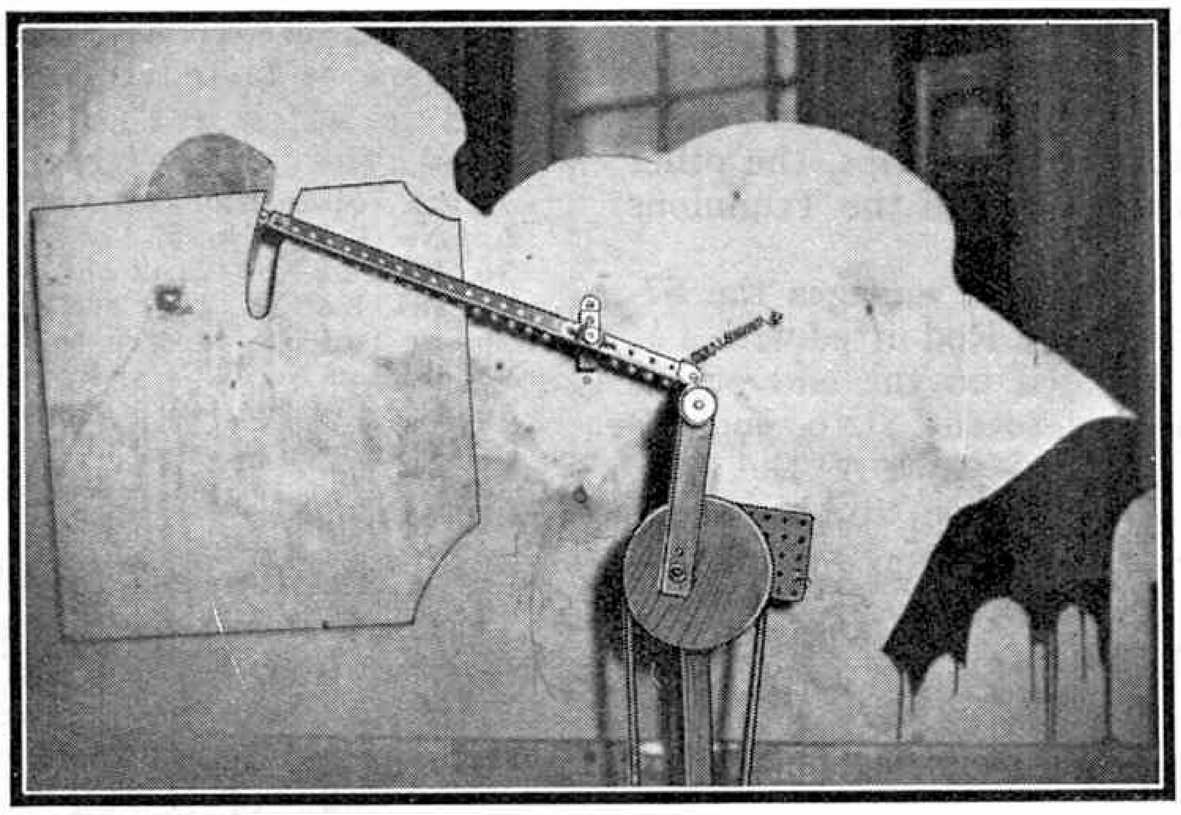
A raised platform, consisting of a $4\frac{1}{2}" \times 2\frac{1}{2}"$ Flat Plate spaced away from the cutout by long Bolts, carried a Rod on which was mounted a large wooden pulley.

A pin about 1″ from the centre of this pulley held one end of a short connecting rod that linked up the pulley with the end of a 12½″ Girder. The drive from an electric motor behind the cutout was transmitted to the pulley by means of a leather belt. The use of a "flasher" enabled the winking movement to be easily and naturally made. The second figure served to hide the mechanical arrangement from the view of the spectators, and thus kept everybody guessing as to how the effect was produced. After a week's successful display at the cinema the cutout was transferred to a shop window in one of the principal streets of the town, where it proved a remarkable attraction.

A striking cutout in which the famous Hollywood star Joan Blondell, on the right, was made to wink!

A film that had for its theme the working of marionettes provided a great opportunity for staging a novel publicity display, and it was decided to run some form of puppet show in the vestibule of a cinema that was to screen this film. Nothing elaborate was contemplated, but it was felt that a taste of the plot would create public interest in, and a desire to see, the film. The presence of real "puppeteers" could hardly be considered. In any case they would only have been able to give shows periodically, and these would have taken up so much room that they would have seriously interfered with the passage of patrons in and out of the cinema. Another disadvantage was that in the intervals when the show was resting many of the people who viewed the idle display would fail to be impressed by it.

It was therefore decided to build a miniature stage and to equip it with a single mechanical figure representing the star of the film, playing a piano. The figure was cut out of three-ply, and any suggestion of flatness about it was removed by the artist, who painted in the lights and shadows so skilfully that it looked a perfect replica of the film actor, except that such people are usually more than 2 ft. in height. The limbs of the figure were separate units and were pivoted to the trunk to form a sitting attitude. A cutout piano was set within his reach.



Rear view of the same cutout showing how Meccano parts were utilised to bring about the amusing winking effect.

Overhead and behind the proscenium arch a series of Meccano Gears carried on their faces ½″ loose Pulleys. The Pulleys acted as rotary cams, and each had a looped thread that passed round its groove and extended down to one limb of the figure. The idea of the loops and the free movement of the ½″ Pulleys was to avoid any tightening and subsequent tangling that might have resulted from sticking of the threads. The threads were black, and as they were suspended against a black backcloth they were almost invisible. When the display was working the arms of the figure were raised and lowered alternately. The feet, just touching the pedals of the piano, gave a good impersonation of pedalling, and a microphone assisted by providing suitable music. The result was an amusing representation of piano-forte playing.

When the model was in operation it was observed that several additional movements could have been added without the ensemble becoming too complicated. A singer, for instance, could have been worked on a separate plane behind the piano, entailing only a portion of the mechanism used for the piano player.

The task of evolving this interesting display convinced me that there are great possibilities in allying Meccano with puppets, and I think that I shall experiment in that direction when I can find the necessary spare time.

Another interesting instance of a mechanically-operated advertisement was a cuckoo clock in which Meccano mechanism was provided to carry out the task of making the cuckoo appear from the interior of the clock. This very effective cutout, which was specially designed to advertise the film *"The Cuckoo in the Nest,"* was 7 ft. in height and was painted to represent one of the familiar old-fashioned cuckoo clocks. A printed notice invited patrons to pull a cord that hung down from the clock, and when this invitation was accepted, a bird, curiously resembling Ralph Lynn, promptly appeared from behind a straw-built nest at the top of the cutout and gave an excellent imitation of the cuckoo's call. The mechanism employed in this cutout was similar to that used in persuading Joan Blondell to wink, except that the movement was in an upward direction. Patrons themselves provided the motive power, and at the same time actuated a "birdie horn," a kind of reed bellows that produced the notes. A balance weight caused the cuckoo to fall back to its original position when the cord was released.

Practically all the displays referred to in this article were running continuously for nine hours per day on six successive days. In certain cases they were then passed on to another theatre. It is an excellent testimony to the efficiency of Meccano that, apart from the tightening up of a few nuts, no attention at all was required.

New Meccano Models

Jack—Destroyer—Arch Bridge—Dynamometer—Derrick Crane

MODEL-BUILDING activities are generally put aside during the summer months to give place to outdoor hobbies, but there are many occasions when model-building provides just the hobby for a quiet hour or so. On a fine day the Meccano Outfit can be taken into the garden, and of course it is always a standby for days when the weather will not permit outdoor sports and amusements. The examples of new models illustrated on these pages will provide many interesting hours for their construction and operation.

Car Lifting Jack

Car lifting apparatus forms an important part of the equipment of modern garages. In some cases the entire vehicle is lifted above ground level, or a jack is used for raising one end. The chief essentials of a jack are speed and ease of operation, and the model in Fig. 1 is of a modern type of quick-acting jack that can easily be moved from one part of a building to another for different jobs.

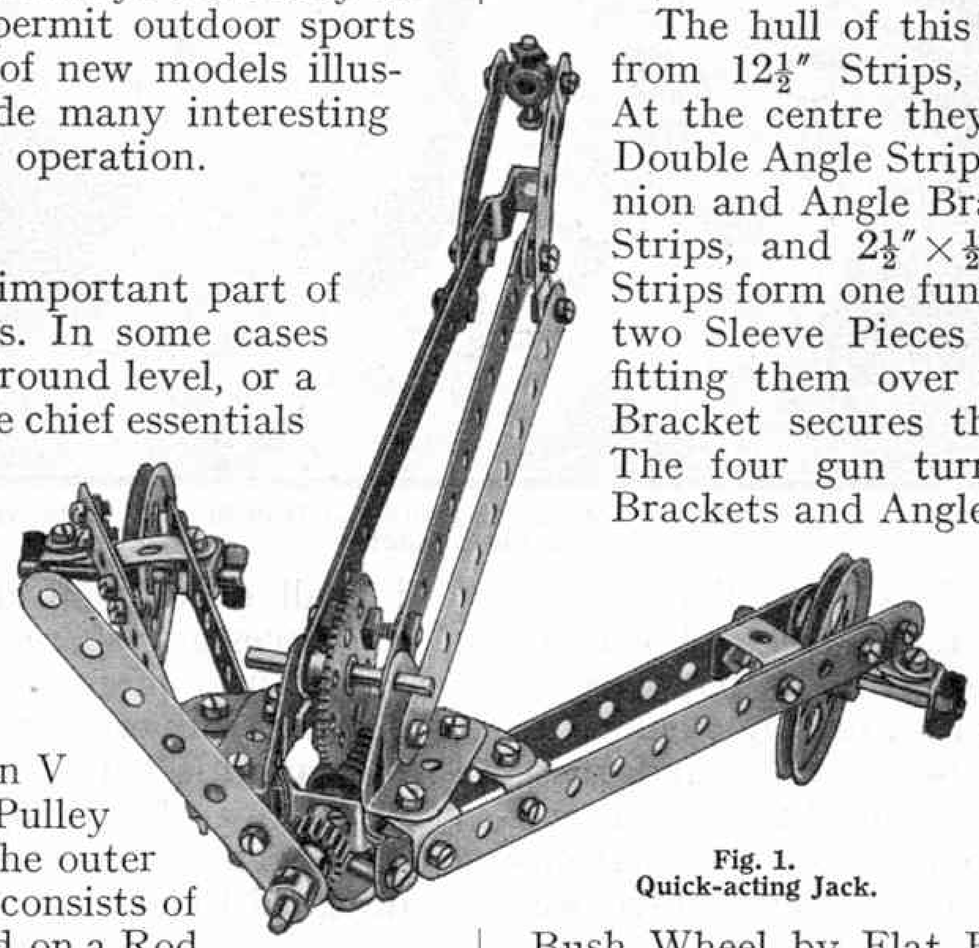


Fig. 1. Quick-acting Jack.

The base consists of two arms in V formation and travelling on a 1″ Pulley at the apex and a 2″ Pulley at the outer end of each arm. The lifting arm consists of two $5\frac{1}{2}$″ Strips supported at one end on a Rod carrying a 57-teeth Gear to which the Strips are rigidly attached by a 1″ Screwed Rod. At the outer ends of the Strips $2\frac{1}{2}$″ Curved Strips are pivoted, and their lower ends are pivoted to further $5\frac{1}{2}$″ Strips, the other ends of which are pivotally attached to the Trunnions as shown.

The arm is raised by a Worm that engages the 57-teeth Gear. The Worm is carried on a Rod fitted with a $\frac{1}{2}$″ Pinion, and a $3\frac{1}{2}$″ Strip is pivoted on the end of the Rod. An Angle Bracket, pivoted to the Strip, engages the teeth of the Pinion and forms a pawl. As the lever is moved to and fro, the Pinion, and hence the Worm, is rotated. By reversing the position of the Angle Bracket the direction of rotation of the Worm can be changed, and thus the lifting arm can be raised or lowered as required.

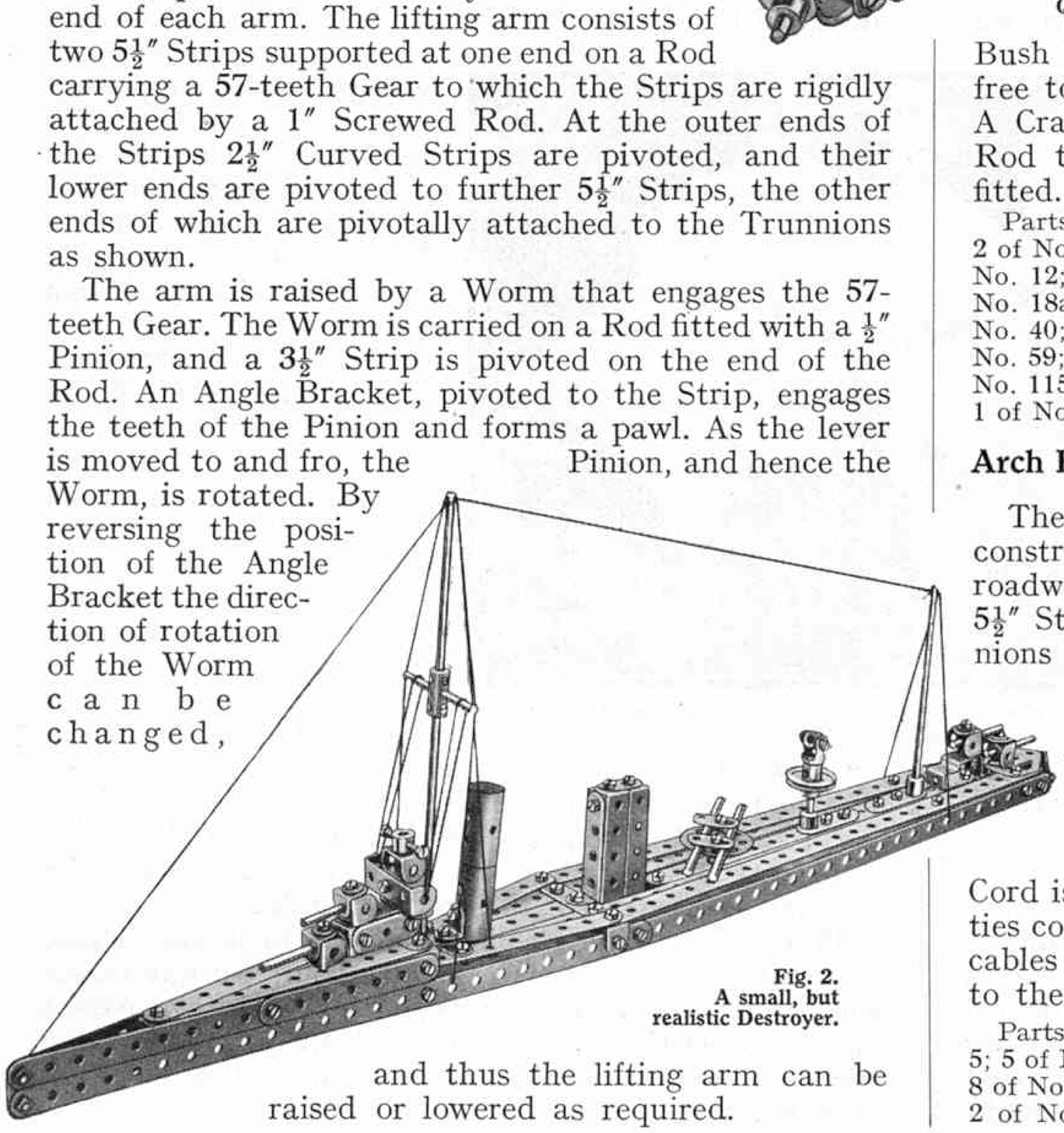


Fig. 2. A small, but realistic Destroyer.

Parts required for Jack: 8 of No. 2; 1 of No. 3; 4 of No. 5; 4 of No. 11; 13 of No. 12; 2 of No. 12a; 3 of No. 17; 1 of No. 18a; 2 of No. 20a; 1 of No. 22; 1 of No. 26; 1 of No. 27a; 1 of No. 32; 4 of No. 35; 40 of No. 37; 13 of No. 37a; 1 of No. 44; 3 of No. 59; 1 of No. 90; 2 of No. 90a; 2 of No. 111; 1 of No. 111c; 1 of No. 125; 2 of No. 126; 1 of No. 147b; 1 of No. 165.

Destroyer

The hull of this realistic little model is built up from $12\frac{1}{2}$″ Strips, two of which form each side. At the centre they are spaced apart by a $2\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strip and at the stern by a Flat Trunnion and Angle Brackets. The deck is filled in with Strips, and $2\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strips and $2\frac{1}{2}$″ Strips form one funnel, the other being built up from two Sleeve Pieces that are connected together by fitting them over a Chimney Adaptor. An Angle Bracket secures the forward funnel to the deck. The four gun turrets are represented by Double Brackets and Angle Brackets, and a $1\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strip represents the bridge. Above this a Fork Piece is mounted on a $\frac{3}{4}$″ Bolt and carries a $\frac{3}{8}$″ Bolt in each of the tapped bores in its boss to form the range finder.

Torpedo tubes are represented by Axle Rods clamped to a Bush Wheel by Flat Brackets, the Bush Wheel being free to rotate about a bolt that is gripped in its boss. A Crank is bolted to the deck, and carries a 1″ Axle Rod to which a 1″ Pulley and a Swivel Bearing are fitted. The "spider" represents the searchlight.

Parts required for Destroyer: 6 of No. 1; 7 of No. 2; 2 of No. 3; 2 of No. 4; 2 of No. 5; 2 of No. 6a; 8 of No. 10; 4 of No. 11; 14 of No. 12; 4 of No. 12a; 2 of No. 15; 3 of No. 16; 1 of No. 17; 4 of No. 18a; 1 of No. 22; 1 of No. 24; 64 of No. 37; 2 of No. 38; 1 of No. 40; 1 of No. 44; 2 of No. 45; 2 of No. 48; 6 of No. 48a; 4 of No. 59; 2 of No. 62; 1 of No. 63; 1 of No. 111; 2 of No. 111c; 1 of No. 115; 1 of No. 116; 1 of No. 126a; 1 of No. 147b; 2 of No. 163; 1 of No. 164; 1 of No. 165.

Arch Bridge

The effective little model shown in Fig. 3 is of simple construction but has quite a realistic appearance. The roadway is made from $12\frac{1}{2}$″ Strips extended by means of $5\frac{1}{2}$″ Strips, and the approaches are supported on Trunnions bolted across $2\frac{1}{2}$″ × $\frac{1}{2}$″ Double Angle Strips. Each pair of Double Angle Strips is fitted with a $2\frac{1}{2}$″ Curved Strip bolted across the top. The end towers of the bridge proper are made of $2\frac{1}{2}$″ Strips, and Double Brackets bolted at their lower ends carry the $12\frac{1}{2}$″ Strips that are curved to form the arch at each side of the structure. Cord is used for bracing purposes to represent the cross ties connecting the two side arches, and also the tension cables that support the roadway. The platform is secured to the arch by means of Flat Brackets.

Parts required for Arch Bridge: 4 of No. 1; 4 of No. 2; 8 of No. 5; 5 of No. 10; 2 of No. 11; 8 of No. 12; 36 of No. 37; 6 of No. 37a; 8 of No. 38; 1 of No. 40; 6 of No. 48a; 2 of No. 90a; 6 of No. 111c; 2 of No. 126.

Dynamometer

This interesting model can be used for comparing the power of different Electric or Clockwork Motors, and shows the principle of operation of dynamometers that are used in actual practice for ascertaining the horse power of an engine. This type of dynamometer is used to measure the power of an engine while it is driving other apparatus or machinery, and does not absorb any power except that lost in frictional resistance, so that the power exerted by the engine can be noted throughout its period of motion. This particular type of dynamometer is known as the "Tatham" Transmission Dynamometer, and the principle of operation will be understood from the model, by means of which some interesting experiments can be carried out.

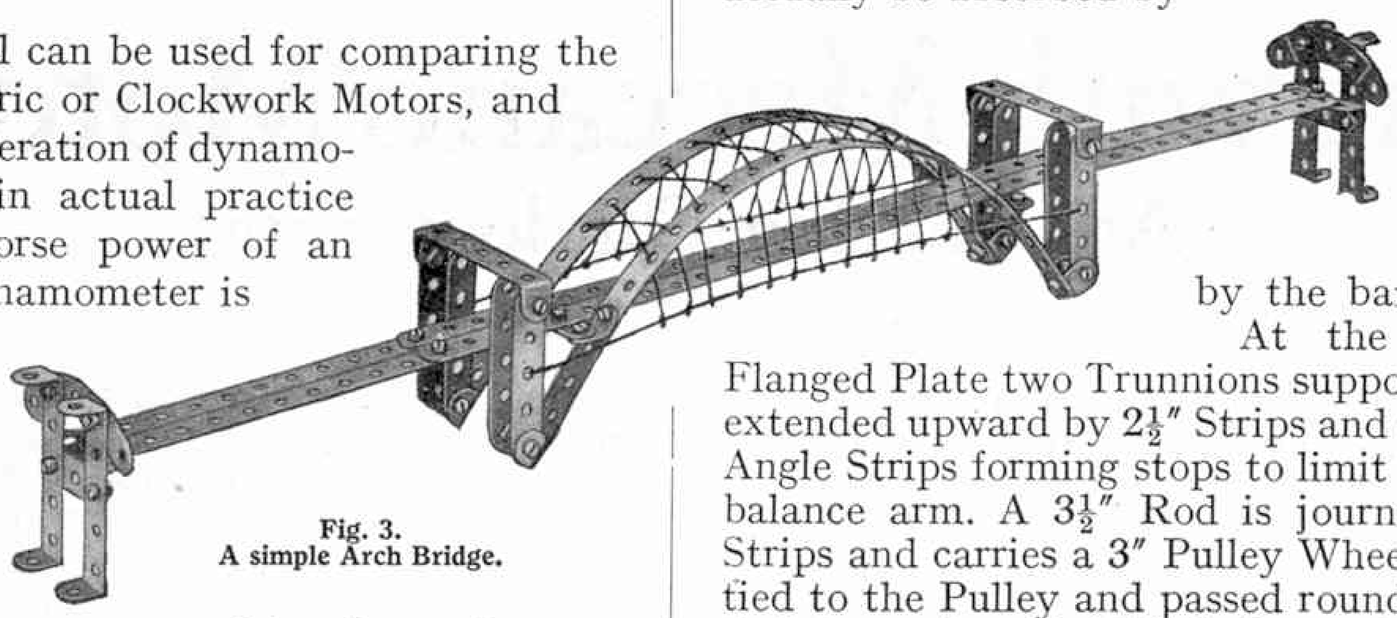


Fig. 3.
A simple Arch Bridge.

The base consists of a $5\frac{1}{2}'' \times 2\frac{1}{2}''$ Flanged Plate and at one end three $5\frac{1}{2}''$ Strips are bolted vertically to each side and extended at the top by Flat Trunnions. A $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip connects the two sets of side Strips, and a $3\frac{1}{2}''$ Axle Rod is journalled in the upper holes of the Trunnions. The Rod carries a Bush Wheel to which a $12\frac{1}{2}''$ Strip is bolted, and it will be noticed that the Rod passes through one of the holes in the Strip. On each side of the Rod a $\frac{1}{2}''$ Reversed Angle Bracket is bolted to the Strip, and these form bearings for 2" Rods carrying 1" Pulleys. At the shorter end of the Strip a Hook is fixed and carries Strips that exactly balance the other end of the $12\frac{1}{2}''$ Strip, so that normally the long balance arm so formed is in a state of equilibrium.

The Crank Handle carries two 3" Pulley Wheels, and a length of cord is passed round one of these and over each of the 1" Pulleys on the balance arm, and then round a 1" Pulley on a Rod journalled directly above the Crank Handle. A $5\frac{1}{2}''$ Strip is cranked as shown and pivoted to the base Plate. Its upper end carries a $\frac{1}{2}''$ loose Pulley mounted on a $\frac{3}{8}''$ Bolt, and a Rubber Band keeps the Pulley lightly pressed against the belt of cord.

The lower 1" Pulley is connected to the driven machinery in the actual dynamometer, and in the model a band brake is fitted to absorb power that would actually be absorbed by the machines, and thus to demonstrate the operation of the model according to the amount of power required to overcome the friction generated by the band brake.

At the other end of the Flanged Plate two Trunnions support $5\frac{1}{2}''$ Strips that are extended upward by $2\frac{1}{2}''$ Strips and carry $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strips forming stops to limit the movement of the balance arm. A $3\frac{1}{2}''$ Rod is journalled in the vertical Strips and carries a 3" Pulley Wheel. A length of cord is tied to the Pulley and passed round its rim before being tied to a pivoted $12\frac{1}{2}''$ Strip serving as a brake lever. Cord is tied to the base Plate and passed round a 1" Pulley on the Rod of the lower driven 1" Pulley, and is then tied to the Axle Rod of the 3" Pulley on the right of the illustration. When the brake is depressed the Pulley is rotated and the cord wound on to the Rod, thus tightening round the driven Pulley.

The 3" Pulley on the outer end of the Crank Handle can be driven from a Motor, or the Crank Handle can be turned by hand to show the operation of the model. When the brake is applied to the driven Pulley there is a tendency for the driving cord to pull down the shorter end of the balance arm according to the resistance offered by the Pulley. As the shorter end of the arm is pulled down, a weight is added to the other end of the arm to maintain equilibrium, and in practice the power absorbed can be calculated from the figures showing the weight required to maintain equilibrium, its distance from the fulcrum of the balance arm, and the distances of the two free Pulleys from the fulcrum of the arm.

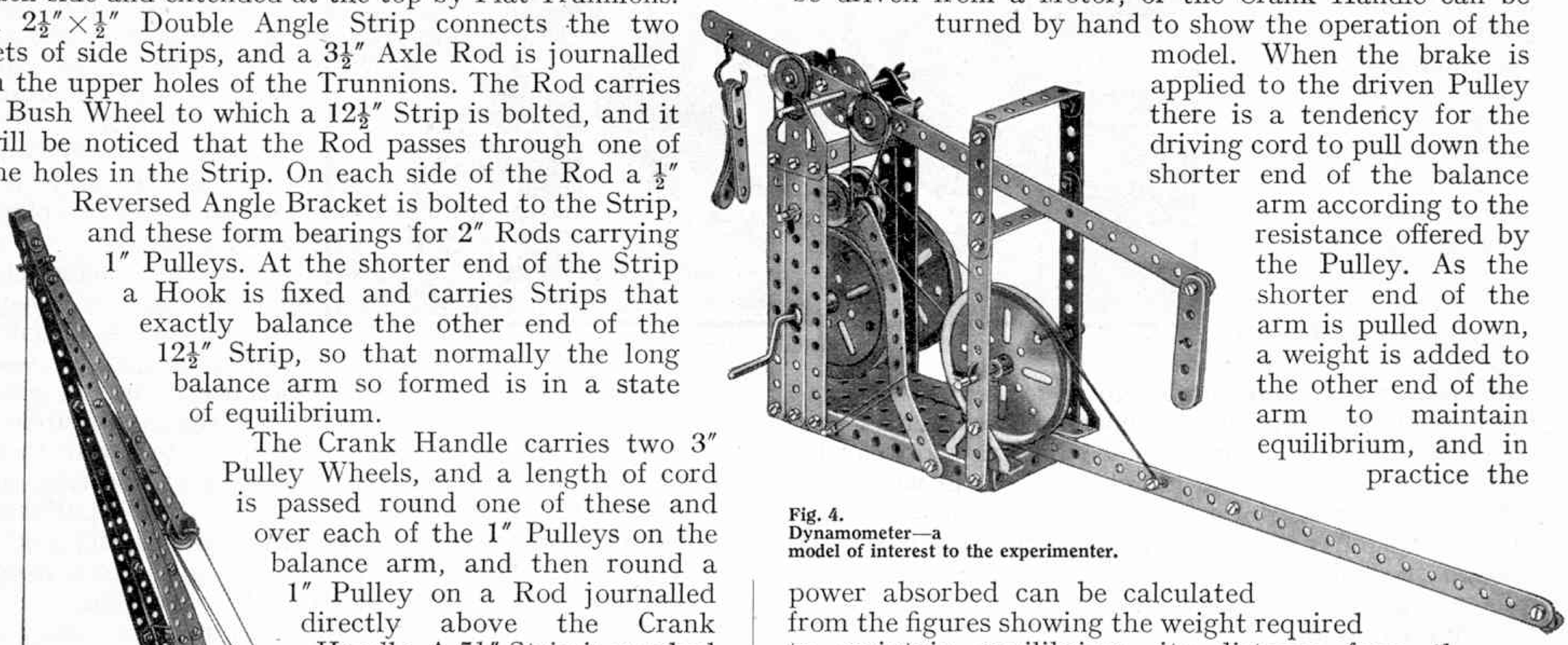


Fig. 4.
Dynamometer—a model of interest to the experimenter.

If a Motor is available some interesting experiments can be carried out with this model, and even with the hand operating gear its method of functioning will be found quite interesting and will demonstrate the principle of operation of the actual device.

Parts required for Dynamometer: 3 of No. 1; 8 of No. 2; 9 of No. 5; 2 of No. 10; 3 of No. 12; 3 of No. 16; 2 of No. 17; 1 of No. 19s; 3 of No. 19b; 4 of No. 22; 1 of No. 23; 1 of No. 24; 8 of No. 35; 33 of No. 37; 7 of No. 37a; 8 of No. 38; 1 of No. 40; 3 of No. 48a; 1 of No. 52; 1 of No. 57; 4 of No. 90a; 3 of No. 111c; 2 of No. 125; 2 of No. 126; 2 of No. 126a.

Derrick Crane

The model crane shown in Fig. 5 is fitted with hoisting and luffing movements, and the centre post is mounted on a swivel to allow for slewing of the jib. A 3" Pulley is fixed with the boss downward to the Flanged Plate forming the base, by means of $\frac{3}{8}''$ Bolts. Another Pulley turns on the fixed Pulley, and carries two Sector Plates and two vertical $12\frac{1}{2}''$ Angle Girders. The Sector Plates are spaced apart by $2\frac{1}{2}''$ Strips and a $2\frac{1}{2}'' \times \frac{1}{2}''$ Double Angle Strip and carry the winding and hoisting handles. The upper ends of the vertical Angle (*Continued on page 316*)

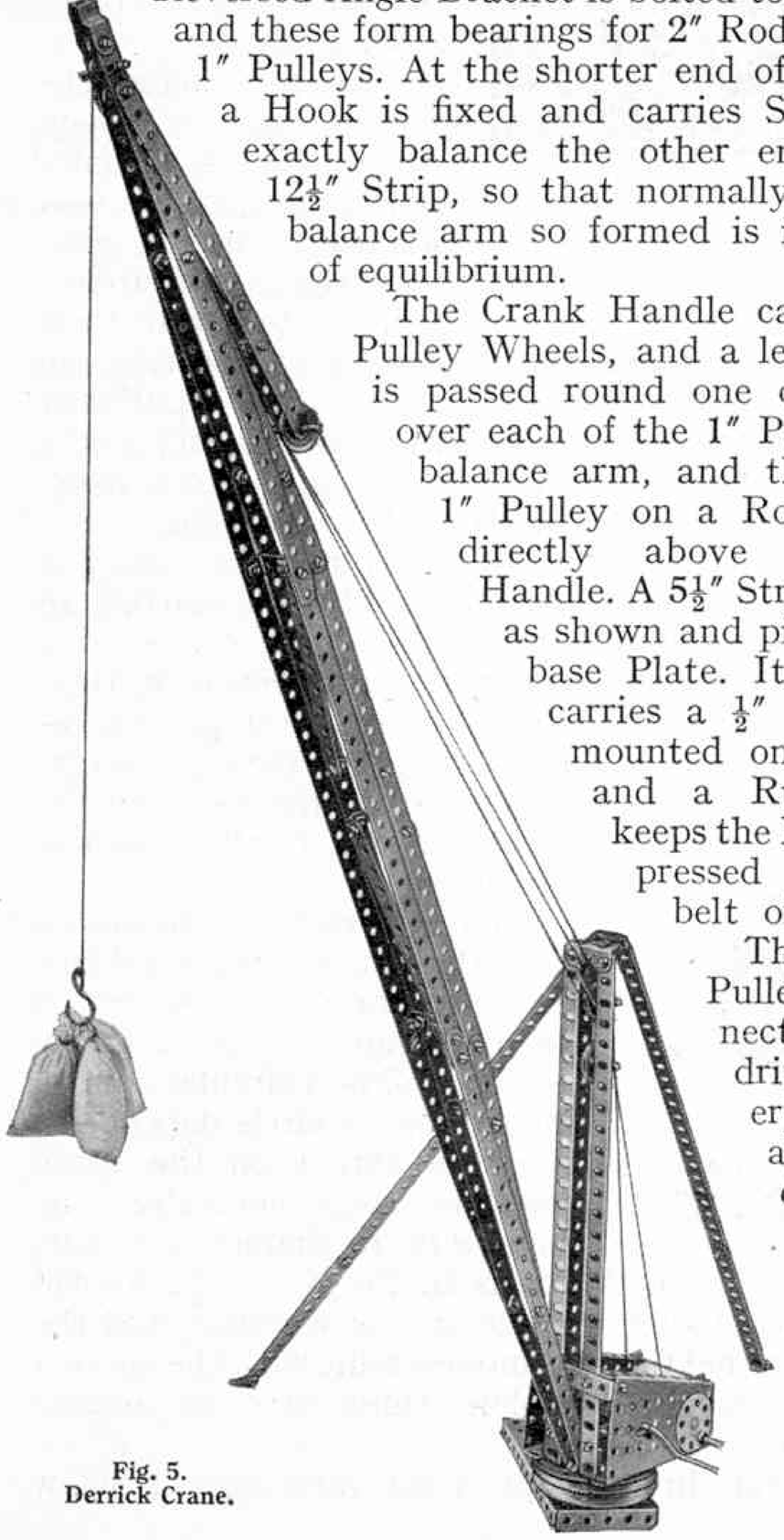


Fig. 5.
Derrick Crane.

Racing with Meccano Motor Cars

An Exciting Outdoor Sport

MOTOR racing is an intensely fascinating sport that provides plenty of thrills for spectators as well as for the competitors. In England the centre of motor racing activity is at Brooklands track, the scene of many exciting tests of speed, endurance and skill. Racing on English roads is not allowed, and consequently there are no great events to compare with the immensely popular Continental races, but the conditions of road racing are met with on a smaller scale at Donington Park, near Derby, where the roads through private grounds provide good substitutes for open highways. In addition, sand racing, hill climbs at Shelsley Walsh, and reliability trials all provide thrills for the motor racing enthusiast. The big events on the Continent and the road races in Ireland and the Isle of Man are of still greater interest.

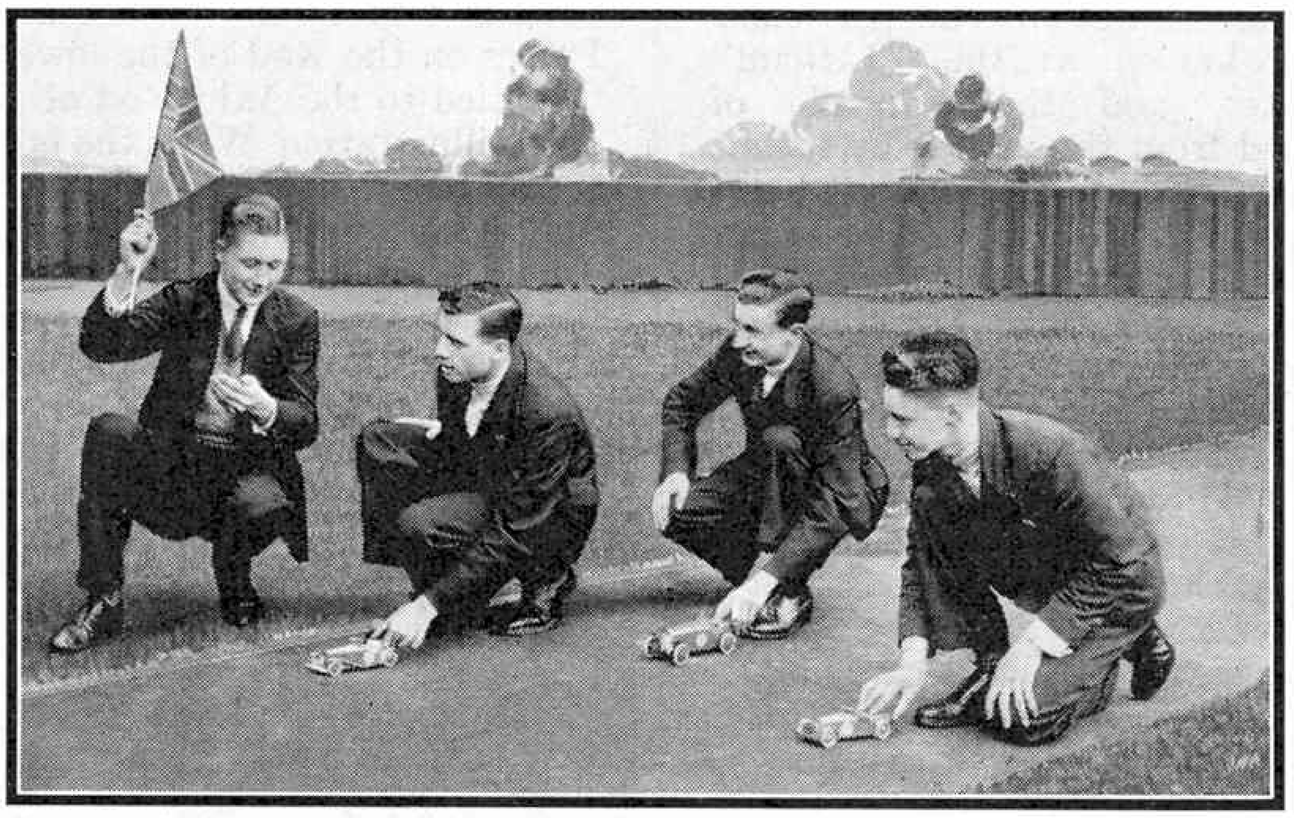


Fig. 1. Cars in their handicap positions, waiting for the fall of the starter's flag.

Some of the excitement of motor racing can be captured by organising events for models of the real cars, and on the fine days of summer some excellent sport can be had from races, trials and hill climbs, etc., in which the different Meccano Motor Cars are pitted against each other in a similar manner to their prototypes. If several enthusiasts build their own cars and arrange race meetings, much pleasant fun can be had out-of-doors during the summer months.

The Meccano range of Motor Cars now includes the different models that can be built with Outfits Nos. 1 and 2, and also the Non-Constructional Sports Car that is illustrated in Fig. 2. The finished cars have very attractive lines and represent modern sports cars and racing cars. At first it would seem that if two identical models are raced together the same results would be obtained each time, but in practice it will be found that this is not the case. The performances of the different models will be found to vary considerably, especially if the competing cars include models from each Outfit as well as the Non-Constructional model.

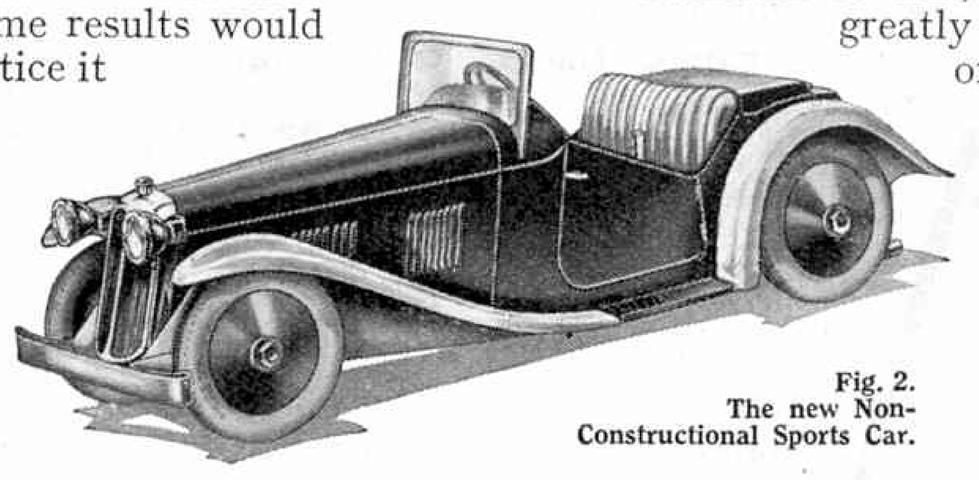


Fig. 2. The new Non-Constructional Sports Car.

The speed and length of run depend to a considerable extent upon the skill and care that have been exercised in assembling the models. A little extra care given to the correct alignment of the different parts will result in better running, and this is particularly the case with the No. 2 Outfit models, in which slipshod work may result in unnecessary friction in the rear Axle. By making quite sure that the Motor Chassis Girders and Body Sections are correctly placed, freedom of running of the Rear Axle will be ensured. The competitor who pays regular attention to his model by oiling all rotating parts will be rewarded by a slight increase of speed. The Wheel bearings and the Motors should be oiled at intervals and a little graphite grease should be applied to the springs. Meccano Oil and Graphite Grease are excellent for this purpose.

There should be no difficulty in finding a suitable track for racing. In many cases it will be found that the garden path is quite suitable, but any fairly smooth and even surface can be used. An asphalt or concrete playground has an excellent surface for racing the models, and although gravel is not usually satisfactory, if it is well laid and rolled out it can be used for a track, but any fairly large stones should be removed to prevent the possibility of upsetting the cars. The Cars will not maintain their course so well on gravel as on asphalt or concrete, on account of the small stones and irregularities. A pathway paved with flag stones is not generally satisfactory as the edges of the stones are not always absolutely level.

Before running a race it is advisable to get some idea of the respective performances of the competing cars. For this purpose a preliminary heat should be run, starting all the vehicles from the same mark, the object of this being to ascertain if there are very marked differences in their speeds. According to the result of this test the handicapping should be arranged, and by paying careful attention to this, the interest of the race will be greatly increased owing to the closeness of the finish.

There are many varieties of races, the simplest being a direct run on a straight course; but if space is available the cars may be set to follow a circular course. The size of the circle depends to a certain extent on the space available, but generally one about 9 ft. in diameter is suitable. Cars built from the parts in the No. 2 Outfit will cover four laps of such a circle on one winding, and the Non-Constructional Car and models built with the aid of a No. 1 Outfit would complete three laps in similar circumstances.

Competing cars in an event of this kind cannot follow

exactly the same circular course, but each can be provided with its own path by means of a plan that also allows for handicapping. This is simply to give the slower cars a distance allowance by setting them to run on inner circles, leaving the fastest car to follow the original course. The necessary circles can readily be drawn on the floor by means of a piece of chalk at the end of a string cut to the required radius and placed with its free end at the common centre.

As in the case of a race on a straight course, the handicapping is based on preliminary trials, or knowledge obtained in other races of the capabilities of the cars concerned. Steering requires special attention, and competitors should be allowed trials to enable them to discover the setting of the steering of their vehicles that will keep them in their correct tracks.

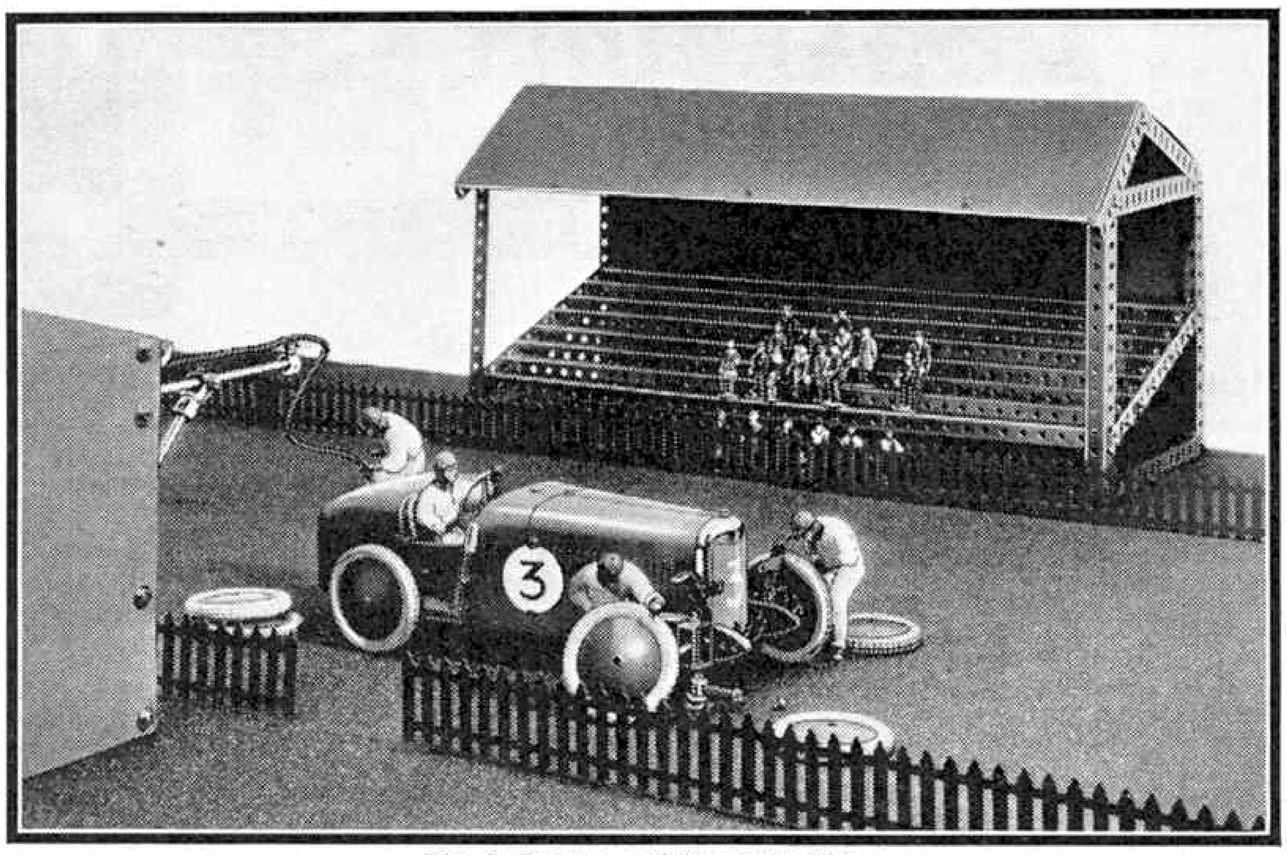


Fig. 3. Intense activity at the Pits.

Races run on circular or straight tracks will provide many thrills besides those caused by close finishes. Although the cars may be set to follow a definite course, a slight irregularity of the track or a small stone may cause one of them to bounce off its course, and possibly a collision will result. By careful setting of the front Wheels, and by clearing the track of all stones that are likely to impede the Cars, collisions may be avoided to a great extent.

There is plenty of scope for ingenuity in arranging suitable accessories to give realism to the track or road, as the case may be. Stands may be added at the starting and finishing lines and, of course, the pits for the cars should not be omitted. In actual practice it is here where the Cars are refuelled and where wheels are changed. The complete wheel is changed instead of the tyre only for speed of operation. The photograph in Fig. 3 shows a busy scene when a No. 2 Car comes into the pits for refuelling and a change of wheels. This model is of particular interest as all unnecessary accessories have been removed, as in actual practice for track racing. It will be noticed that there are no Mudguards on the model and the front Bumper Bar, the Number Plates, and Headlamps have been removed. Also there is no Spare Wheel carried. It is necessary to leave the Upper Front Mudguard Brackets in position, as these space the Axle Brackets away from the Chassis Girders, and the omission of the parts would misalign the front Wheels.

Meccano parts can be used effectively for producing different accessories, and the support for the petrol pipe shown in the illustration is made of Meccano parts. Hornby Fencing and Hedges, and also the Trees are useful for improving the lifelike appearance of the track or road, and the fencing is shown in use in Figs. 3 and 4.

Realism can be achieved also during the race itself by adopting as far as possible the methods followed by officials in actual road or track events. For instance, a race can be started, as indicated in the upper illustration on the opposite page, by the fall of a flag held by the starter, and the winner can be flagged in with a checkered flag in the customary manner familiar to most enthusiasts, either from actual experience, or from photographs of the finishes of important races. As the drivers have no control over their cars, it is of little use to arrange signals from the pits during races, but those who wish to enter fully into the spirit of the game can easily arrange beforehand for pit operations of some kind to be carried out at a selected time during the race. For instance, in a three-lap race on a circular course each car could be stopped at the end of its second lap and one or more of the wheels or tyres replaced without removing the model from the ground. This will add interest and excitement to events on a miniature track, for results then will depend on the skill and dexterity of the competitors as much as on the actual speeds of their cars.

Fig. 4 shows a typical situation that arises when the Cars are racing on a circular track. The stand is made up from Meccano parts and covered with cardboard, but of course any suitable material such as wood or cardboard could be used quite satisfactorily for making a stand and other buildings to give a note of realism to the track or road course. The figures in the stand and behind the railings are from the Dinky Toy range and help to improve the lifelike effect. In this case drivers have been provided for the Non-Constructional Car on the left and the No. 1 Car on the right. Aeroplane Pilots are used for this purpose.

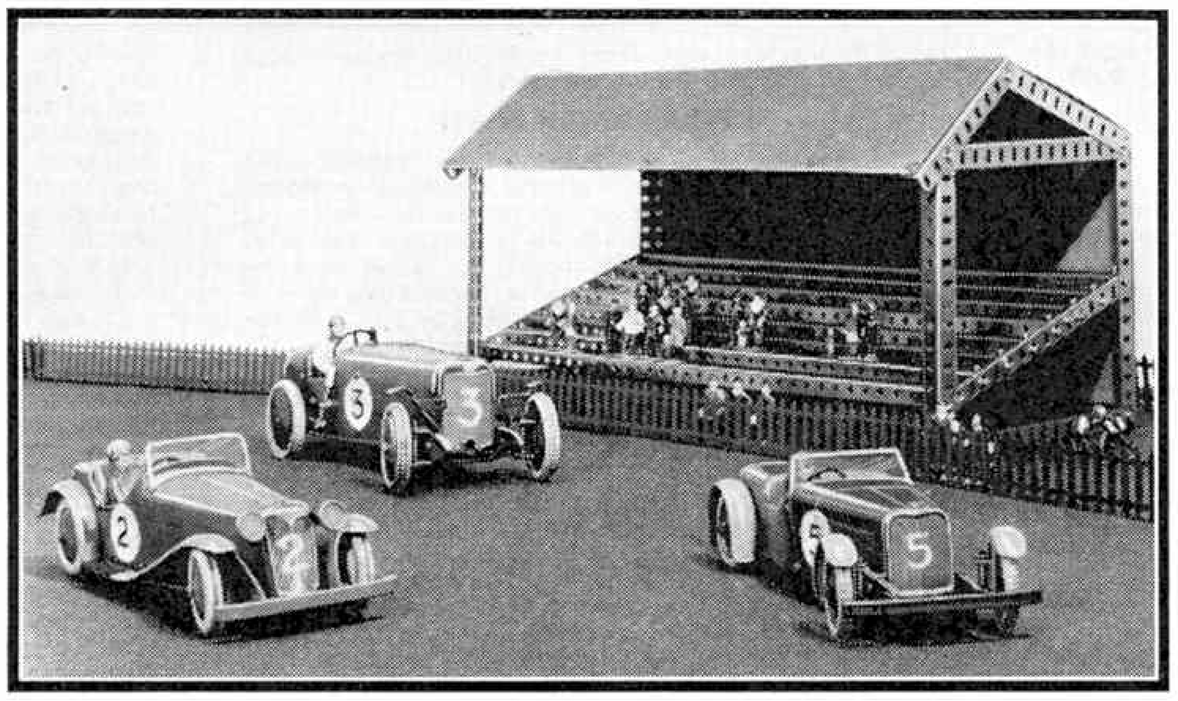
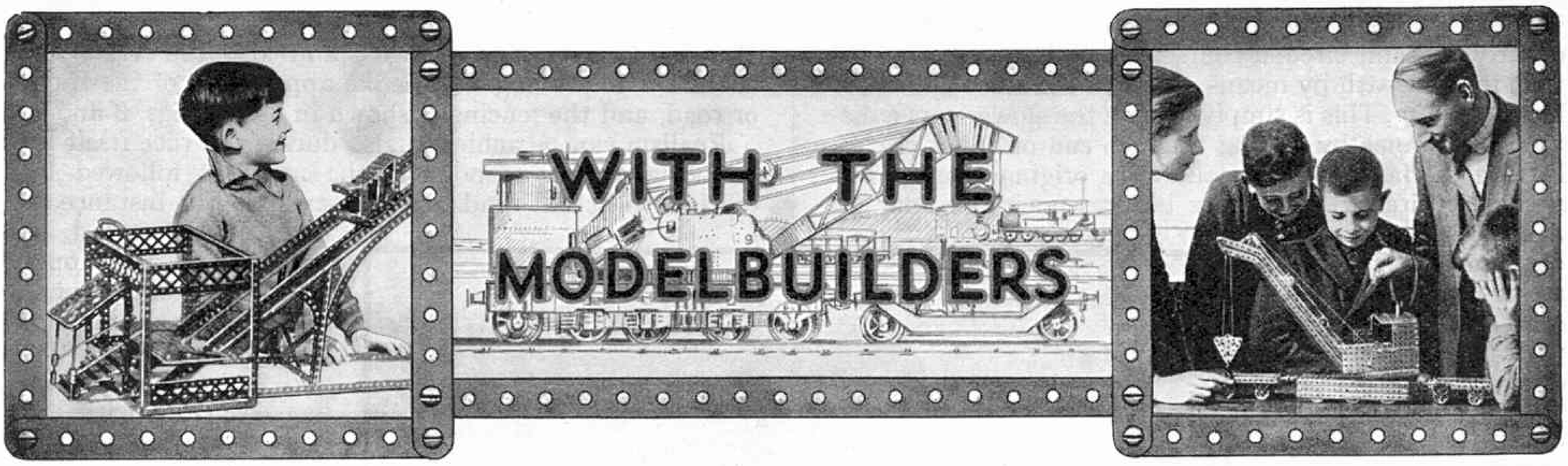


Fig. 4. An exciting moment on a curved track.

Whatever the race may be it is necessary to have numbers for identifying the different Cars as is usual with real cars. Discs of white card or stiff paper can be cut out and painted with a black number, and then stuck on the sides of the models. Alternatively white water colour can be applied to the sides of the Cars and then the number painted over in black. It is not advisable to use oil paint or enamel owing to the difficulty of removing it. The number of the Car should be painted also on the Radiator, or the number can be cut out of white paper and pasted in position on the front of the Car.



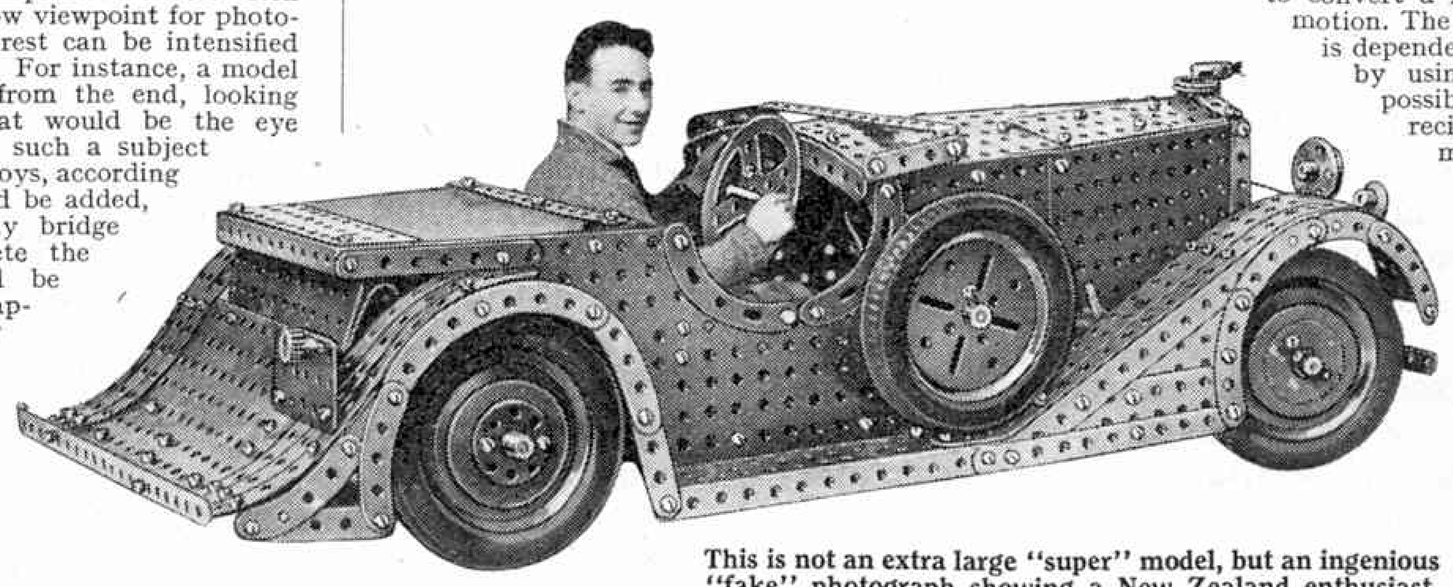
REALISTIC MODEL PHOTOGRAPHS

Amateur photographers will be interested in the photograph illustrated on this page, showing the surprising results that can be obtained by ingenious "faking," and proving that the camera does not always tell the truth! The model is an excellent example of car construction and typifies modern sports car design. The builder has incorporated many refinements and has used his parts to advantage for producing a realistic result.

Fake photographs such as this can be obtained from two separate photographs, one of the car and the other of the driver in the correct attitude. The unwanted parts are cut away from a print of the driver, which is then superimposed on a print of the car, and the final print is obtained by re-photographing the composite print.

In this case the interest in the photograph is enhanced considerably by the introduction of the driver, and by photographing the model from a height that corresponds to the normal eye level of an actual car a greater effect of realism is obtained. Impressive effects often result from the selection of a low viewpoint for photographing models, and the interest can be intensified by choosing a novel viewpoint. For instance, a model bridge can be photographed from the end, looking along the roadway from what would be the eye level of a person crossing. In such a subject Meccano Motor Cars or Dinky Toys, according to the scale of the model, could be added, and in the case of a railway bridge Hornby Trains would complete the effect. A model crane could be photographed carrying out appropriate operations according to the type of crane, and a steam shovel would of course be shown engaged on excavation work. There are many other models that provide good subjects for novel photographs, and the keen photographer will find much interest in work of this nature.

The summer months are of course the best time for outdoor photography, and readers who have not already tried this branch of photography should keep in mind its possibilities for a fine afternoon.



This is not an extra large "super" model, but an ingenious "fake" photograph showing a New Zealand enthusiast, K. Anderson, at the wheel of his Meccano model. The car secured first prize in the Meccano Section of the Gisborne (N.Z.) Winter Show Association.

MOTOR CAR MODELS

The model illustrated shows how a realistic motor car body can be built from Meccano Strips and Plates. An exceedingly attractive result has been obtained, and this is due mainly to the correct use of appropriate parts. Some model builders resort to considerable bending and twisting of parts in order to reproduce the bodywork, but this model shows that realism can be obtained with very little bending. As far as possible mutilation of Meccano parts should be avoided in all model-building. In this case Curved Strips have been used to advantage for the different curved surfaces. Strips are bent slightly for the mudguards, and the Flat Plate at the rear of the body has been curved a little, greatly improving the appearance of the model. An alternative method of construction would be to bolt transverse Strips between the mudguards, but the result would not be so neat.

A 5½" Curved Strip produces the gentle curve of the dash, and 3" Curved Strips give a neat outline where the body is cut away at the front seats. The valanced mudguards now fitted to many modern cars are reproduced in the model, and 2½" large radius Curved Strips are used to advantage for this purpose.

The representation of disc wheels should be noticed. A 3" Pulley Wheel is used for the wheel, and a Wheel Flange is secured to this and fitted with a Bush Wheel. This produces a solid looking wheel that suggests the massive wheels generally fitted to cars of this type. An interesting feature that gives a finishing touch to the model is the mascot on the radiator top. It is formed from a Coupling and Centre Fork, mounted on a 1" loose Pulley Wheel.

CHASSIS DETAILS

If a complete car is built, much of the detail work incorporated in the chassis is obscured when the model is completed. The chassis provides much scope for ingenuity, however. It is desirable to drive it by means of an Electric Motor, although a Clockwork Motor can be used quite well. The transmission system is likely to be the most interesting part of the construction, and if the chassis is fairly small the design of compact components will call for a considerable degree of skill.

Those who wish to build a chassis of orthodox design will have a gear-box giving four forward speeds and reverse, driven from the engine through a friction clutch and supplying the drive to the differential on the rear axle. The experimenter, however, will find much to occupy his attention in the many forms of variable speed gears and automatic gear-changing devices, traffic clutches and other mechanisms that are now making their appearance in some cars. Although at present these devices are not in general use, it seems likely that ultimately they will replace the conventional design of gear-box. Such models are very interesting to construct and operate, but are often difficult to build on a small scale.

Chassis design has undergone great changes during the last few years with the result that there are now many forms of chassis from which the model-builder can select a prototype for his model.

UPHOLSTERED SEATS

The provision of good representations of upholstered seats in Meccano models is always a difficult problem, and in models such as motor cars and motor buses, etc., small seats of this type are likely to give difficulty. For these models it will frequently be found that the seats in the Motor Car Constructor Outfits can be used to advantage to enhance the model. The No. 1 Motor Cars are provided with a seat approximately 2¼" wide and perforated in the centre to take a 6 B.A. Bolt. The seats for the No. 2 Cars are somewhat larger, being 2¾" wide, and provided with two holes to take standard Meccano bolts. They have also small lugs on each side for 6 B.A. Bolts. These seats are excellent for small models of cars and for tramcars and motor buses. They represent wide seats to take two persons.

LIFELIKE REALISM FOR MODELS

When a model is completed it is always desirable to add any accessories that will increase its realism, and it is surprising how lifelike are the effects that can be produced by the addition of a few figures. These individuals can be built up from standard Meccano parts, and if possible they should be arranged to carry out some operation. For instance, a model hand-operated winch or windlass could be provided with one or two figures to wind the Crank Handle. By pivoting the bolts where the legs and arms are connected to the body the figures can be made to move in a very realistic manner. Similarly, in model workshops the addition of Mechanicians carrying out different operations would considerably increase the attractiveness of the model. Workshops provide much scope for working models, and a number of Mechanicians can be arranged to carry out different operations such as hammering, sawing, grinding and turning, etc. In some cases the figure need only be placed before the machine in a lifelike attitude, while in others it can be arranged to work by suitably pivoting the joints and connecting up to the operating mechanism through Cranks and levers or by means of cord.

Motor vehicles can be improved by placing small figures in the driving compartments, and in the case of passenger vehicles, inside the model as well. Cranes, excavators and similar models can be provided with drivers and their assistants. Models of this type should be operated in surroundings suggestive of the operations they are carrying out, and to produce an atmosphere of realism it is necessary to add a number of small figures to the scene of activities. Meccano models can be used, or as an alternative the Dinky Toys. The Dinky Toys are generally suitable where figures built of Meccano parts would be too big, and they are obtainable in many different forms representing different types of workers. The Engineering Staff are probably the most suitable for general use in models, but uses can also be found for the Passengers and Station Staff, etc., according to the type of model.

CAM CONSTRUCTION

Cams are used for various models where it is required to convert a rotary motion into a to-and-fro motion. The movement obtained in this way is dependent on the shape of the cam, and by using different shaped cams it is possible to obtain many variations of reciprocating movement. A symmetrical cam produces a movement in which the return stroke occurs at the same speed as the forward stroke, and the angle of the cam sides governs the speed of the strokes in relation to the speed of the cam. A steep sided cam produces a rapid to-and-fro movement, whereas a cam with gradually sloping sides gives a comparatively slow reciprocating motion.

The necessity sometimes arises for a rapid return stroke, and this movement can be provided by cams, as in the case of the picking motion in the Meccano Loom. A cam of this type has one gradually sloping face that terminates abruptly so that the tappet drops suddenly under the influence of springs. A new cam of this type can be built by securing a Double Angle Strip between two Face Plates by means of Angle Brackets. The Double Angle Strip should be curved to the required degree, and if necessary may be extended by bolting Angle Brackets to the Face Plate. As the part rotates, the tappet is raised slowly by the Double Angle Strip, but when it drops off the end the movement is sudden.

It will be seen that cams have many applications where Cranks or Eccentrics cannot be used to give the requisite motion. The tappets should always be so arranged that they are in continuous contact with the surface of the cam.

CELLULOID PLATES.—The proposal that sheets of clear celluloid, perforated at the edges, should be introduced to the Meccano range merits careful consideration. Such parts would be useful for windows in different structures and for motor vehicles and other instances where imitation glass is required. The uses for the parts would be chiefly ornamental, but the idea will be kept in mind for further attention. (*Reply to S. Simpson, Warrington.*)

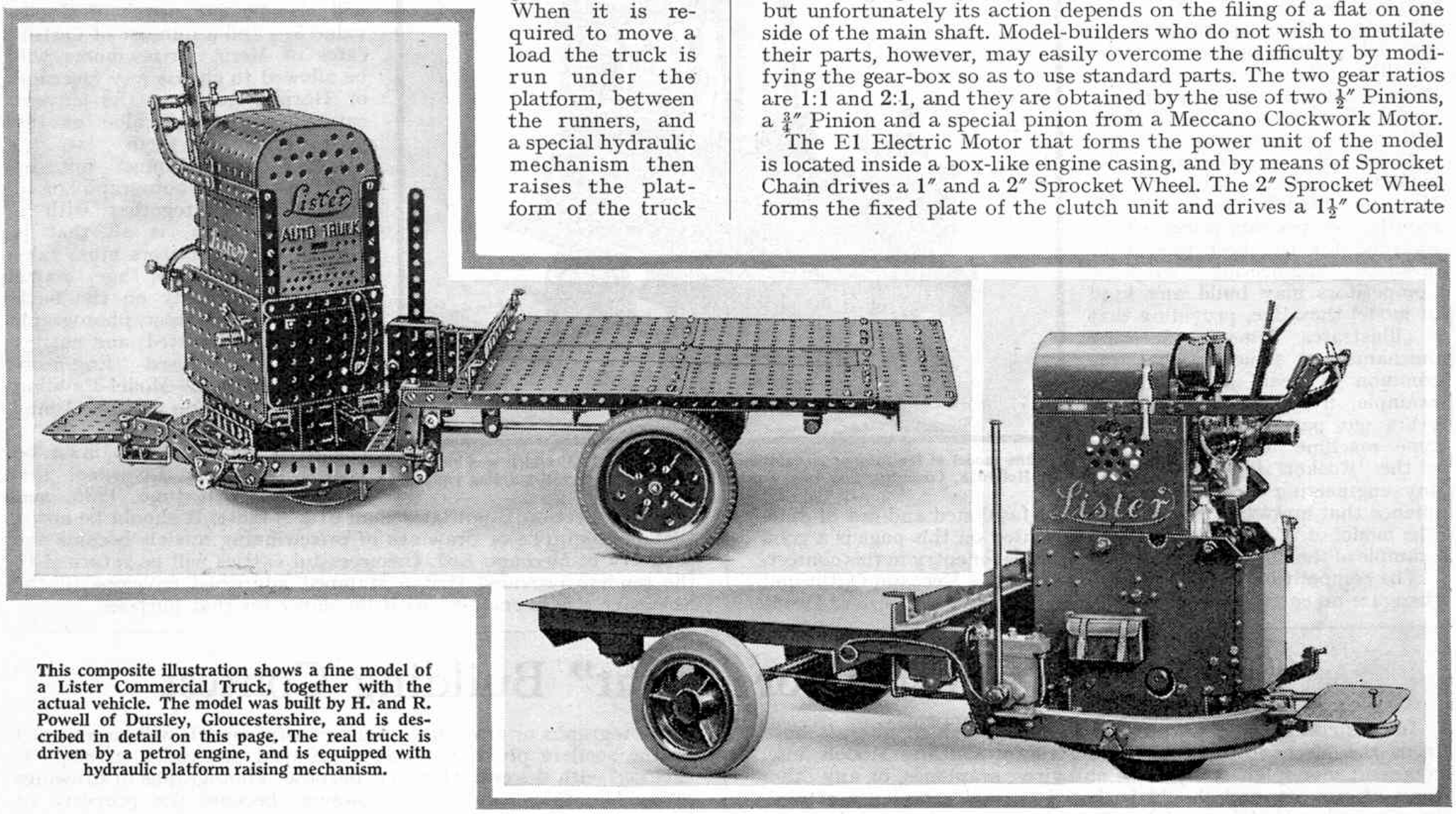
V DRIVING BELTS.—Driving belts of V section give a non-slip drive between pulleys but are scarcely necessary in the Meccano system. Rubber Bands can be used for transmitting a light drive between Pulleys fairly close together, and Pulleys spaced almost any distance apart can be connected by means of Spring Cord. When using Spring Cord for driving purposes the ends should be joined together by means of the Coupling Screws (No. 58a). If a positive drive is required, Sprocket Chain should be used when gearing is impracticable. Two parallel shafts that are too far apart to permit the use of spur gears for driving between them can be connected by means of a Rod at right angles to them and driving through Bevel Gears. Meccano Bevels give ratios of 1 : 1 and 3 : 1 so that two pairs used as described above will give a ratio of 1 : 1, 3 : 1, or 9 : 1. (*Reply to B. Laker, Leicester.*)

Lister Truck Made With Meccano

A Good Subject for Model-Building

ON this page we illustrate a good model of a Lister Commercial truck that was built recently by H. and R. Powell of Dursley, Gloucestershire. The model won First Prize in a Meccano Model-Building Contest, and as it is simple to construct and possesses many novel features, it should be of interest to other model-builders.

The Lister truck is one of several types used in factories and workshops for transporting goods from one department to another. The goods to be moved are stacked on platforms raised from the ground on runners. When it is required to move a load the truck is run under the platform, between the runners, and a special hydraulic mechanism then raises the platform of the truck and lifts the load and its platform from the ground.



This composite illustration shows a fine model of a Lister Commercial Truck, together with the actual vehicle. The model was built by H. and R. Powell of Dursley, Gloucestershire, and is described in detail on this page. The real truck is driven by a petrol engine, and is equipped with hydraulic platform raising mechanism.

The hydraulic mechanism consists of a piston working in a cylinder into which oil can be pumped by a hand lever. The incoming oil forces the piston along the cylinder, and by means of levers the movement of the piston is used to raise the lifting platform of the truck. To unload the truck it is only necessary to release a valve, which allows the oil to flow from the cylinder, so lowering the lifting platform to its normal position.

The model reproduces all the movements of the prototype, and incorporates the Lister patent steering gear, sprung wheels, internal expanding brakes on all wheels, platform raising mechanism, two speed gear-box and controls. The model is built to a scale of 1:4½ and is 29 in. in length, with a total weight of 15 lb.

Angle Girders, bolted together to form channel section girders, are used for the chassis, and are sufficiently rigid to obviate the necessity for corner bracing. The power unit, a Meccano 6-volt Motor, swivels on a bearing consisting of two Hub Discs, one of which is secured to the main chassis and the other to the power unit. The two bear together, and they allow the Motor and front road wheel to turn easily for steering purposes.

Double coil springing is fitted to the two rear wheels. The bearings are made from Channel Bearings, which are able to slide vertically between two Strips. Two short Rods are pushed through the end holes of the Channel Bearings and are secured to the chassis at the top. Compression Springs are placed on the Rods between the Channel Bearing and the chassis. The rear brake shoes are made by curving a 4½″ × ½″ Double Angle Strip and securing this to the Channel Bearing by means of an Angle Bracket. A Collar fixed on to the end of a Screwed Rod forms a cam and fits in between the ends of the brake shoes. The brake drums consist of Boiler Ends bolted to the wheels.

The rear brakes are operated by pressure on a foot pedal, which can be seen in the accompanying illustration. The front wheel brake is applied or released by a hand-operated ratchet brake fitted to the motor unit and having a Rack Segment for the quadrant.

The two speed gear-box used in this model is very compact, but unfortunately its action depends on the filing of a flat on one side of the main shaft. Model-builders who do not wish to mutilate their parts, however, may easily overcome the difficulty by modifying the gear-box so as to use standard parts. The two gear ratios are 1:1 and 2:1, and they are obtained by the use of two ½″ Pinions, a ¾″ Pinion and a special pinion from a Meccano Clockwork Motor.

The E1 Electric Motor that forms the power unit of the model is located inside a box-like engine casing, and by means of Sprocket Chain drives a 1″ and a 2″ Sprocket Wheel. The 2″ Sprocket Wheel forms the fixed plate of the clutch unit and drives a 1½″ Contrate through friction with a rubber disc. The Contrate is loose on its shaft and is linked to a ½″ Pinion by means of loops of wire wound round the Set Screws of both Gears. The 2″ Sprocket is also loose on the shaft, which carries also a ¾″ Sprocket. The shaft is journalled in the side plates of the model and also passes through the gear-box. A small piece of Compression Spring between the 2″ Sprocket and the Contrate holds the clutch normally out of engagement. The two parts of the clutch are engaged by moving a lever, which bears against the back of the Contrate and presses it against the rubber disc.

The ½″ Pinion drives a second ½″ Pinion on the layshaft, and is forced up against the side plates of the gear-box by means of the clutch spring. The layshaft itself carries another ½″ Pinion and a Pinion from a Meccano Clockwork Motor. Part of the main shaft inside the gear-box is filed flat and it carries a ¾″ Pinion and a ½″ Pinion, the grub screws of which are screwed up just sufficient to engage the flat, but yet are loose enough to allow the Pinion to slide along the shaft. By moving a selector lever the two Pinions can be moved along the shaft until either the ¾″ Pinion engages the special Pinion, or alternatively the two ½″ Pinions are in mesh. The drive is taken from the ¾″ Sprocket already mentioned to the front road wheel (a 3″ Pulley fitted with a Dunlop Tyre) by means of Sprocket Chain.

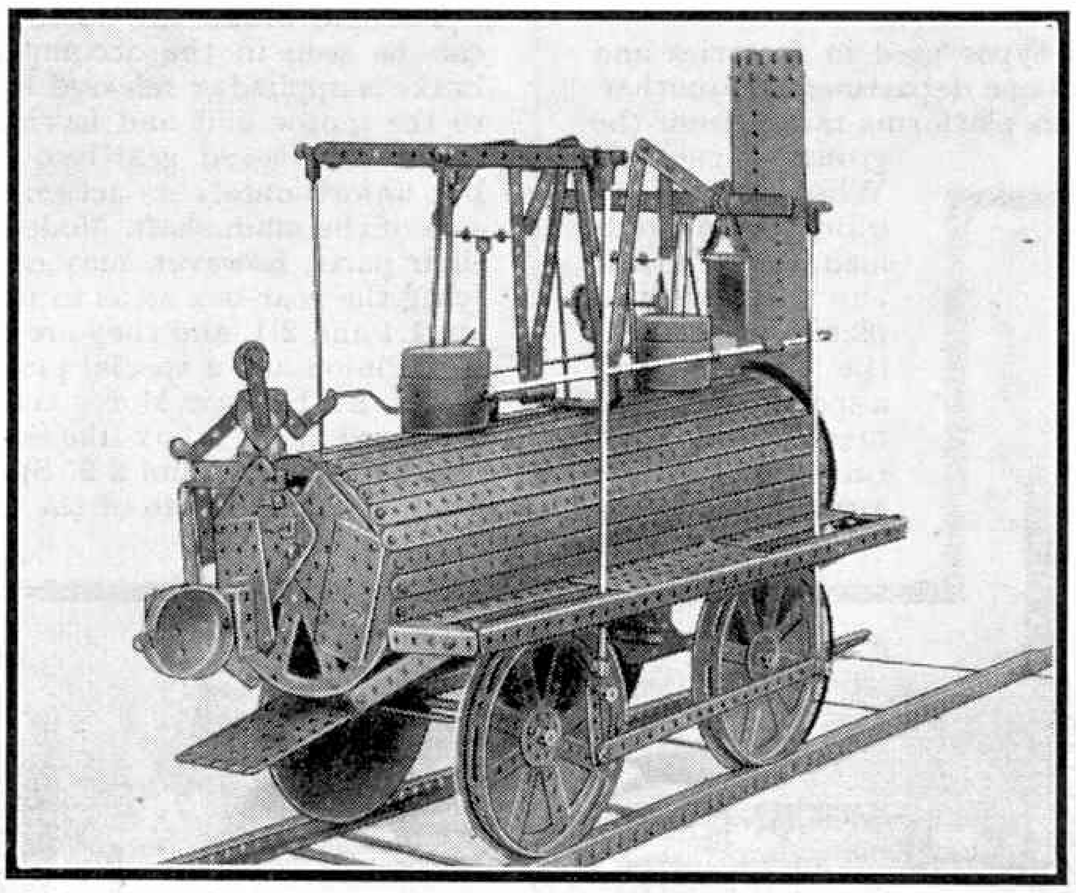
As the road wheel is sprung, it was necessary to devise some mechanism for keeping the driving chain under constant tension. This was done by employing a jockey sprocket *(Continued on page 316)*

Prizes for Meccano Models

"Engineering of the Past" Competition

Some time ago we organised an "Engineering of the Past" Competition, which proved very popular, and therefore we have decided to arrange this month a second contest of that type. It is always interesting to look back over years gone by and to compare the everyday life and commonplace sights of those days with the world as we know it, for engineering and science have made tremendous progress during the present century. The motor cars of to-day, for example, are very different, both in appearance and internal construction, from those of 1910, while locomotives and ships of 50 years ago appear very crude when compared with those with which we are familiar.

These old engineering relics make splendid subjects for Meccano models, and in this month's competition prizes will be awarded for the best models of obsolete engineering subjects. Competitors may build any kind of model they like, providing that it illustrates some engineering mechanism or structure that was common in years gone by. For example, flying machines of 20 years ago, paddle steamships, old type machine tools, locomotives of the "Rocket" type, and in fact any engineering structure or appliance that nowadays is considered old-fashioned and out of date. The model of *"Locomotion No. 1"* illustrated on this page is a good example of the kind of model that is suitable for entry in this contest.



A fine model of the famous locomotive "Locomotion No. 1," which was built by L. Hollyoak, Coventry, and won a prize in an "M.M." model-building contest.

The competition is open to every owner of a Meccano Outfit and there are no entry forms to fill in or fees to pay. Any size of Outfit or number of parts may be used in building models. Entries will be divided into two Sections—A, for readers of all ages living in the British Isles; B, for readers of all ages living Overseas. The age of each competitor will be taken into consideration in awarding the prizes.

The following prizes will be awarded in each Section—First, Meccano or Hornby Goods value £2-2s. Second, Goods value £1-1s. Third, Goods value 10/6. There will also be five prizes of Goods value 5/– and a number of Certificates of Merit. Prizewinners will be allowed to choose any Meccano or Hornby goods in the current catalogues to the value of the prize awarded to them.

Actual models must not be sent. A clear photograph or a good drawing, together with a brief description, is all that is necessary. Competitors must take care to write their age, name and address clearly on the back of each sheet of paper, photograph or drawing submitted, and entries should be addressed "Engineering of the Past" Model-Building Contest, Meccano Ltd., Binns Road, Liverpool 13.

Entries for Section A must be posted to reach Liverpool not later than 29th June, 1935, and those for Section B not later than 31st August. It should be noted that photographs or drawings of prizewinning models become the property of Meccano Ltd. Unsuccessful entries will be returned to the senders provided that a stamped addressed envelope of the necessary size is enclosed with the entry for that purpose.

"Aeroplane Constructor Outfit" Building Contest

In this competition we offer prizes for models of aircraft built from the Meccano Aeroplane Constructor Outfits. Models may represent monoplanes, biplanes, autogiros, seaplanes, or any other form of aircraft, and should be based on real aeroplanes of well-known make. Models must be constructed entirely from Meccano Aeroplane Constructor parts; ordinary Meccano parts must not be used. Each model must be built entirely by the competitor without assistance from anyone. Competitors who wish to send two or more models may do so, but no competitor will be awarded more than one prize. If more than one entry is submitted they will be judged on their joint merits.

Competitors must not, of course, copy the models illustrated in the Aeroplane Constructor Instruction Manuals. They should first of all choose a suitable prototype, and then set to work to reproduce it as closely as possible with Aeroplane Constructor parts. Hundreds of illustrations of actual aeroplanes that will make fine subjects for this Contest have appeared from time to time in the *"M.M."* It is important to bear in mind that the more closely a model resembles the actual aeroplane on which it is based, the greater will be its chance of winning a prize.

Competitors must not send actual models. The best plan is to send a photograph, but if it is not possible to obtain a good photograph a clear drawing will do quite well. Before posting their entries competitors should make sure that each photograph or drawing bears their age, name and address. Envelopes containing entries must be addressed "Aeroplane Constructor Contest," Meccano Ltd., Binns Road, Liverpool 13.

Photographs or drawings of unsuccessful models will be returned to the senders providing that a stamped addressed envelope is enclosed with the entry for that purpose. Photographs or drawings of models that win prizes, however, become the property of Meccano Ltd.

In addition to illustrations of their models competitors should send in any necessary explanations concerning their construction. These should be written neatly on one side of the paper only, and they should be as brief as possible.

Entries will be divided into two Sections as follows: Section A, for competitors of all ages living in the British Isles; and Section B, for competitors of all ages living Overseas. In each Section a separate set of prizes as indicated at the foot of this page will be awarded for the best models. The age of each competitor will be taken into consideration in judging the entries.

Readers living in the British Isles must post their entries in time to reach Liverpool not later than 29th June, 1935. In order to give Overseas entrants plenty of time in which to build and forward their entries we have extended the closing date of Section B to 31st August, 1935.

Prizewinners will be notified by letter as soon as possible after the closing dates, and they will be allowed to select any articles they like from current Meccano and Hornby Train catalogues. Every reader of this month's *"M.M.,"* irrespective of sex or age, is eligible for the competition.

We would remind readers of the importance of stating their name and address, as omission of these has frequently caused promising entries to be disregarded.

Prizes for Aeroplane Contest

The Prizes in each Section, Home and Overseas, of the "Aeroplane Constructor Outfit" Competition are as follows:

First: Meccano or Hornby Goods value £1-1s.
Second: Meccano or Hornby Goods value 15/–.
Third: Meccano or Hornby Goods value 10/6.
Five Prizes of Meccano or Hornby Goods value 5/–.

Model-Building Competition Results

By Frank Hornby

"Autumn" Contest (Overseas Section)

In deciding the prizewinners in this Contest, points were allocated to each model submitted according to its merits when considered under the following heads: Construction (maximum points possible 40); Originality (maximum 25); Realism (maximum 25); General Interest (maximum 10). Total points possible: 100. The competitors who obtained the highest points are as follows:

Section C

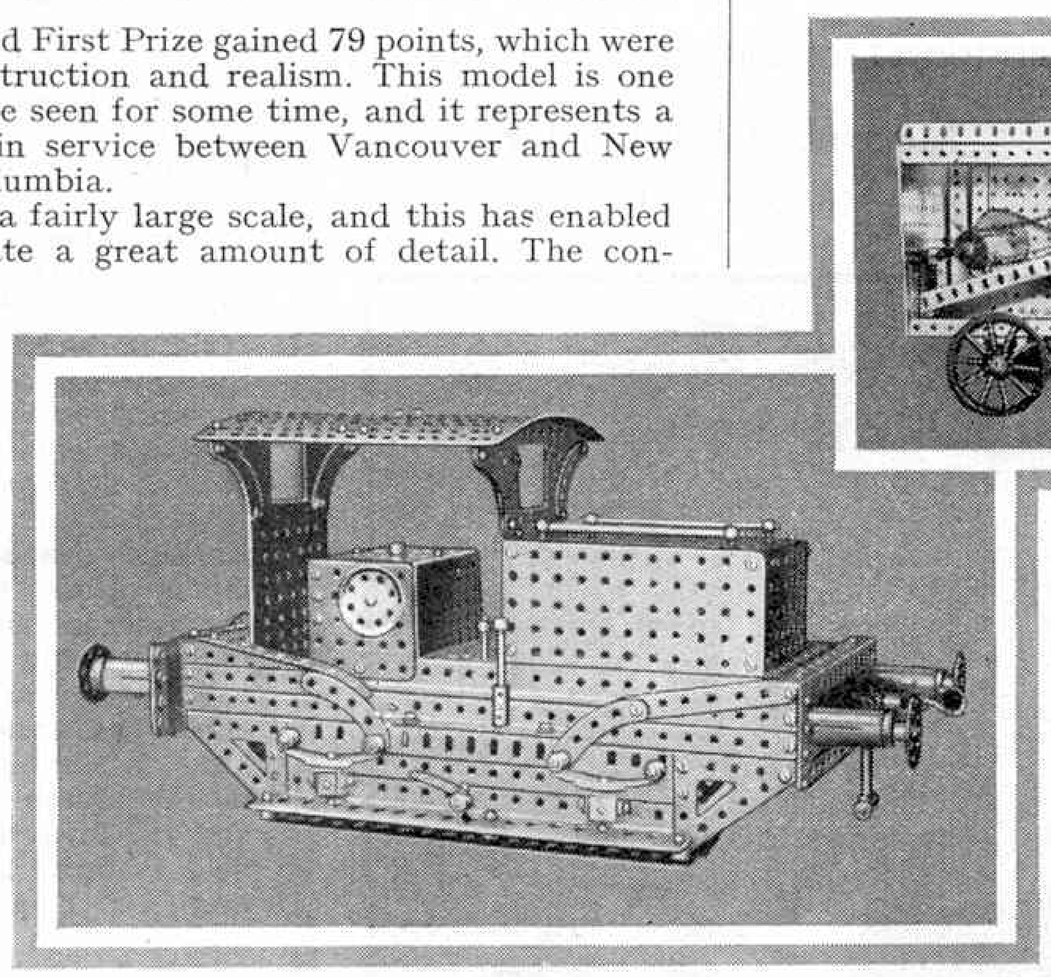
1ST: Meccano or Hornby Goods value £3-3s.: H. Shorten, Regina, Saskatchewan, Canada (79 points). 2ND, Goods value £2-2s.: J. Willems, Antwerp, Belgium (72). 3RD, Goods value £1-1s.: G. den Butter, Amsterdam, Holland (68).

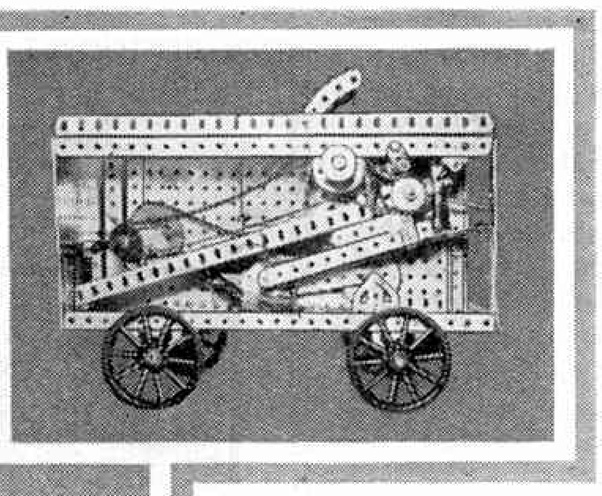
Goods value 10/6: C. Blackbeard, Johannesburg, S. Africa (64 points); R. Keller, Capetown, S. Africa (49); J. Aragones, Barcelona, Spain (49); W. Bladergroen, Amsterdam, Holland (47); B. Lacey, Blenheim, New Zealand (45); R. Doolen, Kyogle, N.S.W. (44); A. Wethmar, Den Haag, Holland (43); E. Shalom, Basra, Iraq (42).

Goods value 5/–: R. Inch, Montreal, Canada (41 points); A Ness, Port Dalhousie, Ontario, Canada (41); J. Pienaar, Johannesburg, S. Africa (40); J. Capelli, Buenos Aires, S. America (39); E. Mulholland, Christchurch, New Zealand (38); W. Jackson, Gatooma, S. Africa (38); R. Pascual, Barcelona, Spain (36); E. Azzopardi, Sliema, Malta (32).

The model that obtained First Prize gained 79 points, which were awarded chiefly for construction and realism. This model is one of the neatest that I have seen for some time, and it represents a transport truck that is in service between Vancouver and New Westminster, British Columbia.

The model is built on a fairly large scale, and this has enabled the builder to incorporate a great amount of detail. The construction of the chassis and the bodywork in general is carried out on ordinary lines and it is in the mechanism that the builder's best work is displayed. The truck is driven by a Meccano 6-volt Electric Motor housed under the bonnet, which is hinged and can be opened as in the actual vehicle. The gear-box provides four forward speeds, reverse and neutral, each gear being selected by means of a change lever working in a gate of the usual kind. The change lever projects through the floor of the driving cab in correct relative position to the clutch and brake controls. From the gear-box the drive is taken to the foremost of the two rear axles. Owing to the weight of the model the standard type of rubber friction clutch was not satisfactory, so Shorten decided to use a clutch formed from two 1½" Contrate Wheels placed face to face. The two rear axles are coupled by simple bevel drive as in the actual vehicle on which the model is based.





(Above) A simple and neatly built model threshing machine by Juan Aragones, Barcelona. (Left) A model of a Dutch street locomotive, which won Third Prize for G. den Butter, Amsterdam.

Second Prize was awarded for an excellent model of a big travelling gun. The constructional work is excellent, but points were lost owing to the fact that several of the parts used were mutilated. The gun chassis is mounted on two huge bogies each of which runs on ten wheels. Large roller bearings made from Circular Girders, Circular Plates and ¾" Flanged Wheels, and placed between the ends of the chassis and each bogie, enable the bogies to handle the weight of the gun when negotiating sharp curves. A third roller bearing, attached to the base of the gun itself, projects below the level of the chassis, and when the gun is in use this bearing can be lowered to the ground so as to relieve the chassis of the recoil shock when the gun is fired. Large jacks also are provided to take the weight of the chassis from the bogies. The barrel of the gun is made from six Boilers, which are bolted together and compressed in such a manner that a tapered barrel is formed. A 1" Tyre pushed over the end finishes off the barrel and forms a thick lip for the gun mouth.

The Third Prize model is the work of G. den Butter and is a close copy of a street tram-locomotive of the type used for hauling public passenger vehicles in Holland. The model is illustrated on this page and should form an excellent subject for other model-builders to copy. It is driven by means of a Meccano Electric Motor, the drive transmission being carried out with Sprocket Chain. Each of the four wheels is fitted with brakes, the shoes of which are held from the wheels by Springs, and can be applied by moving a lever inside the driving cab.

Among the models that won the smaller prizes is a realistic sports tourer motor car, submitted by C. Blackbeard. It incorporates Ackermann front wheel steering and front wheel drive. The front wheels are fully sprung and the drive is imparted to them through differential gear and two Universal Couplings on each side of the model. A three speed, reverse and neutral gear-box also is provided, and there are neatly constructed internal expanding brakes on each wheel. Opening doors and a removable bonnet are features of the bodywork, and the dashboard instruments are represented by Pulley Wheels. Windmill Sails form a very realistic radiator.

Model-builders in search of new subjects to copy would do well to investigate the possibilities of agricultural machinery. This is a branch of engineering that has received very little attention from model-builders, and I am pleased to find a reproduction of a threshing machine among the successful entries in this contest. The machine was submitted by J. Aragones, and is illustrated on this page, and it is interesting to learn that although the model is quite small it will actually thresh corn. The mechanism is automatic in action and is operated by a Meccano Electric Motor. This competitor constructed also a small tractor to haul the threshing machine along the ground.

R. Keller sent a model of the Percival "*Mew Gull*" aeroplane. It is 15½" long and has a wing span of about 20 in. Strips are used throughout the model, and thick wire bent to shape and bolted to the fuselage represents the framework of the cockpit cover. Spats formed from Curved Strips are bolted over the landing wheels.

The model submitted by A. Wethmar is a copy of a 4–6–0 locomotive, in which the boiler is made from 12½" Strips bolted round the rims of two Face Plates, and the valve gear and connecting rods are made from Strips. The headlamps are ¾" Contrates, and a Universal Coupling is used for the coupling mechanism.

Among a few scientific models that formed an interesting group in this contest is a seismograph, which, as readers probably will know, is an instrument for detecting and registering earth vibrations. It was designed by W. Bladergroen, and although the builder has never seen an actual seismograph, his model is delicate enough to register the vibrations caused by heavy traffic along a road. The model consists essentially of a long pendulum, fitted at its lower end with a sharp-pointed pencil. A strip of paper is drawn at a constant speed beneath the pencil point, and if the foundations of the building in which the model is placed vibrate, the movement is imparted to the strip of paper. The pendulum remains comparatively stationary, however, so that the pencil traces a wavy line on the paper. Normally, when the ground is not trembling, the line traced on the paper is straight. The paper is drawn along by means of an old type high-voltage Meccano Electric Motor, which is controlled by a water resistance and a centrifugal governor. An electric lamp operated by the governor automatically lights up when the paper is travelling at the right speed, which of course depends on the kind of vibration to be recorded.

Summer Time Visits

Now that the long light days are with us, every opportunity of enjoying interesting visits should be eagerly seized by Meccano clubs. There should be no difficulty in arranging such visits, for practically all clubs are within reach of some important factory or works, railway goods yard, or engine shed that will prove a source of interest and profit to members. As in all club activities, a visit is most enjoyable when careful preparations are made. The first step of course is to write to the officials concerned for the necessary permission, and a suitable date and time should be fixed, either by correspondence or by a preliminary call, partly in order to avoid inconvenience, but also to ensure that the visit shall be paid at the most interesting time possible. In making preliminary arrangements it is important to state definitely how many members will form the party, and in no circumstances should this number be exceeded.

Those in charge of industrial works, Railway Departments, Gas Works, Electric Power Stations and other suitable places are invariably pleased to welcome their youthful visitors and usually take a considerable amount of trouble to make the event worth while. A return of their courtesy by careful attention to the points I have suggested will ensure a warm welcome on a future occasion. In certain cases visits of this kind have resulted in the formation of new friendships, for those with whom members have come into contact have acquired so much interest in them, and in club life generally, that they have willingly agreed to visit them in the club room and to give talks on their work, and even to take part in the general affairs of the club.

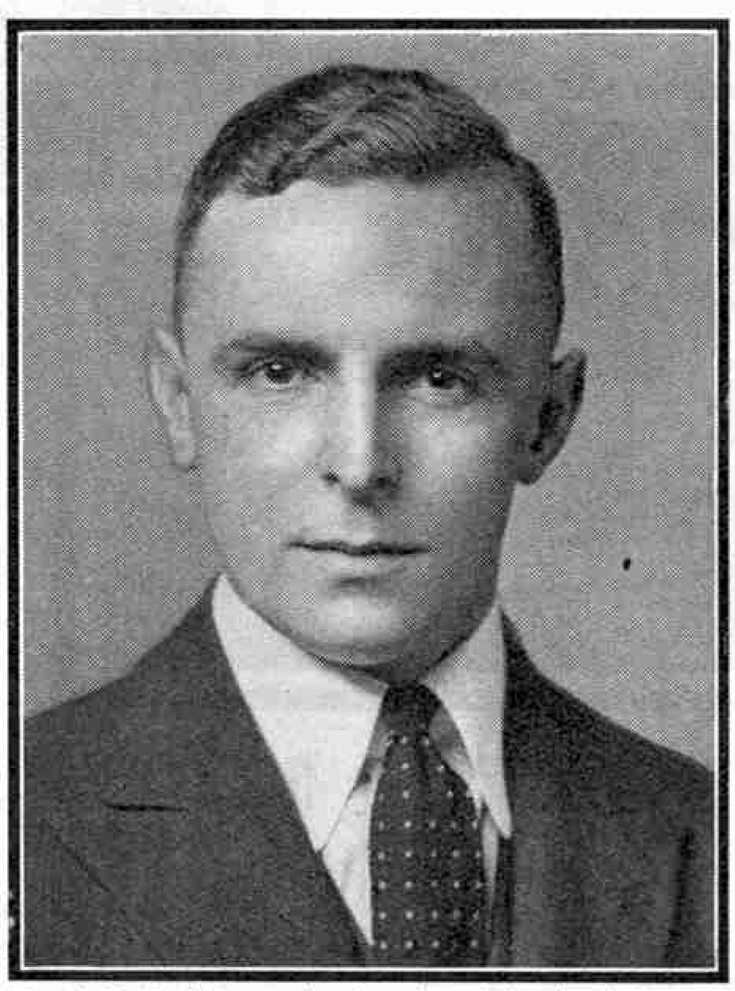
Tours of Meccanoland

I have previously given invitations to Meccano clubs to visit the Meccano works. Clubs from as far afield as Croydon, St. Albans, Kidderminster and Newcastle in the past have taken advantage of this invitation, and on various occasions their members, and those of other clubs whose headquarters are nearer Liverpool, have thoroughly enjoyed a day in the great port, touring the docks, inspecting great liners and passing through the Mersey Tunnel prior to visiting the Meccano Factory. I am always glad to welcome the members of clubs on visits of this kind, and shall be pleased to hear from the Leader of any club who contemplates a visit during the present outdoor season, and to help him to arrange an enjoyable and profitable day among the attractions of Merseyside. As the number of general visitors to the Meccano Factory during the summer is very large, notice of at least five weeks is advisable.

It is always a great pleasure to me to meet the officials and members of visiting clubs and to strengthen the friendships already formed by correspondence. For them a tour of Meccanoland is a great event in club life and an outing that is long remembered.

Meccano Club Leaders

No. 80. Mr. G. B. Inskip



Mr. G. B. Inskip was the founder of the South Parade Modern School (Cleckheaton) M.C., of which he has been Leader since its affiliation in September, 1934. Under his skilful guidance, an excellent programme of Model-building Contests, Visits and Lectures has been followed, and Boxing and Games add greatly to the attractions of club meetings.

Meccano Models to Illustrate Talks

Club Leaders searching for new types of meetings to give variety to their programmes may be interested in the tendency that I have noticed in several successful clubs during the past winter to include talks by members in which Meccano models are used for demonstration purposes. Talks by members of course are by no means new, and indeed have formed part of the programmes of practically every Meccano club since the formation of the Meccano Guild, and the real novelty lies in the encouragement of a choice of practical subjects that can be illustrated by means of models.

Talks of this kind have the advantage that members giving them gain complete mastery of the topics chosen because of the necessity of getting down to detail in building models. They appeal strongly to the constructive instincts of the Meccano boy, and provide variety and encourage originality in model-building. They also are popular with the members who listen to them, for it is easier to grasp the working of a device from a glance at a model than from a lengthy verbal explanation. Suitable subjects can be found without difficulty. In one club, a member who to a certain extent acts as the shipping expert has given talks of this kind on shipbuilding, his demonstration models illustrating the methods adopted and the different types of ships. A wide field is open for experiments on these lines, and I have no doubt that Leaders and members alike will be surprised to find how many subjects lend themselves to practical Meccano demonstrations.

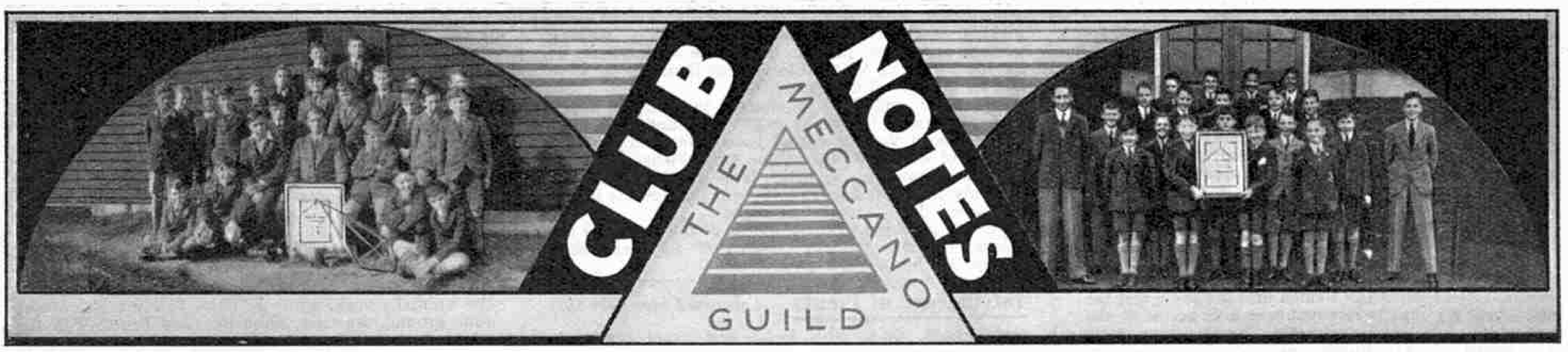
An Attractive Exhibition

The St. Saviour's (Raynes Park) M.C. will hold their second Annual Exhibition on Saturday, 11th May. This event is being organised in association with the St. Saviour's Branch of the Hornby Railway Company, and will be held in the Parochial Hall of St. Saviour's Church, Raynes Park, London, S.W.20. The attractions will include Meccano models built by members, miniature aeroplanes, speed boats and a collection of railway photographs in addition to a large Hornby Train layout. Members will be continuously engaged throughout in typical club activities and refreshments will be available.

The Exhibition will be open from 3 p.m. to 9 p.m., and a cordial invitation is given to all who are interested in Meccano model-building, miniature railways and club work generally. The charge for admission is 2d.

Proposed Clubs

BELFAST—G. Connolly, 45, Botanic Avenue, Belfast.
BRIGHTON—J. Keeley, Glencote, The Ridgway, Woodingdean.
CARDIFF—B. Jones, 94, Taff Embankment, Grange, Cardiff.
HULL—G. A. Blackburn, 15, National Avenue, Hull.
LEIGH-ON-SEA—Mr. J. W. D. Johnstone, Corpus Christi Hall.



Millwall Central School M.C.—The excellent programme has included papers by members on Railway and Engineering subjects, Lantern Lectures on "*London's Railways and Omnibuses*," for which slides were kindly loaned by London Transport, and visits to works and shows held at Olympia. An Exhibition was held in conjunction with the School Display, which was well attended, and the interest aroused has increased enthusiasm for Meccano club work. Club roll: 16. *Secretary:* C. Shaw, Millwall Central School, London, E.14.

Holy Trinity (Barnsbury) M.C.—Excellent progress has been made since the club's successful Exhibition. A talk was given by Rev. C. T. Hogwood on his experiences as an apprentice in the engineering works of Metropolitan-Vickers Ltd. Keen debates have been held, and one on "*Should Juniors and Seniors Mingle at Club Meetings*" was of special interest. Talks have been given by members on their hobbies and on subjects of special and topical interest. "*The Flywheel*" is showing steady progress. Unfortunately Mr. Stuart Wilson has been compelled to relinquish the Leadership of the club owing to the continued illness of his mother. Mr. Wilson retains his interest in club affairs, now under the control of Mr. G. H. Rolf, who is supported by a Committee of Control. Club roll: 65. *Leader:* Mr. G. H. Rolf, 116, Cloudesley Road, London, N.1.

St. Saviours (Wimbledon) M.C.—Members have been busy in the construction of models for the Exhibition to be held this month. Other preparations have included the design and construction of a large Hornby Railway, with appropriate scenery, the collection of railway photographs and tickets, and the construction of aeroplanes and other features of the display. Details of the Exhibition are given on the opposite page. Club roll: 14. *Secretary:* A. Wakefield, 39, Elm Walk, Raynes Park, London, S.W.20.

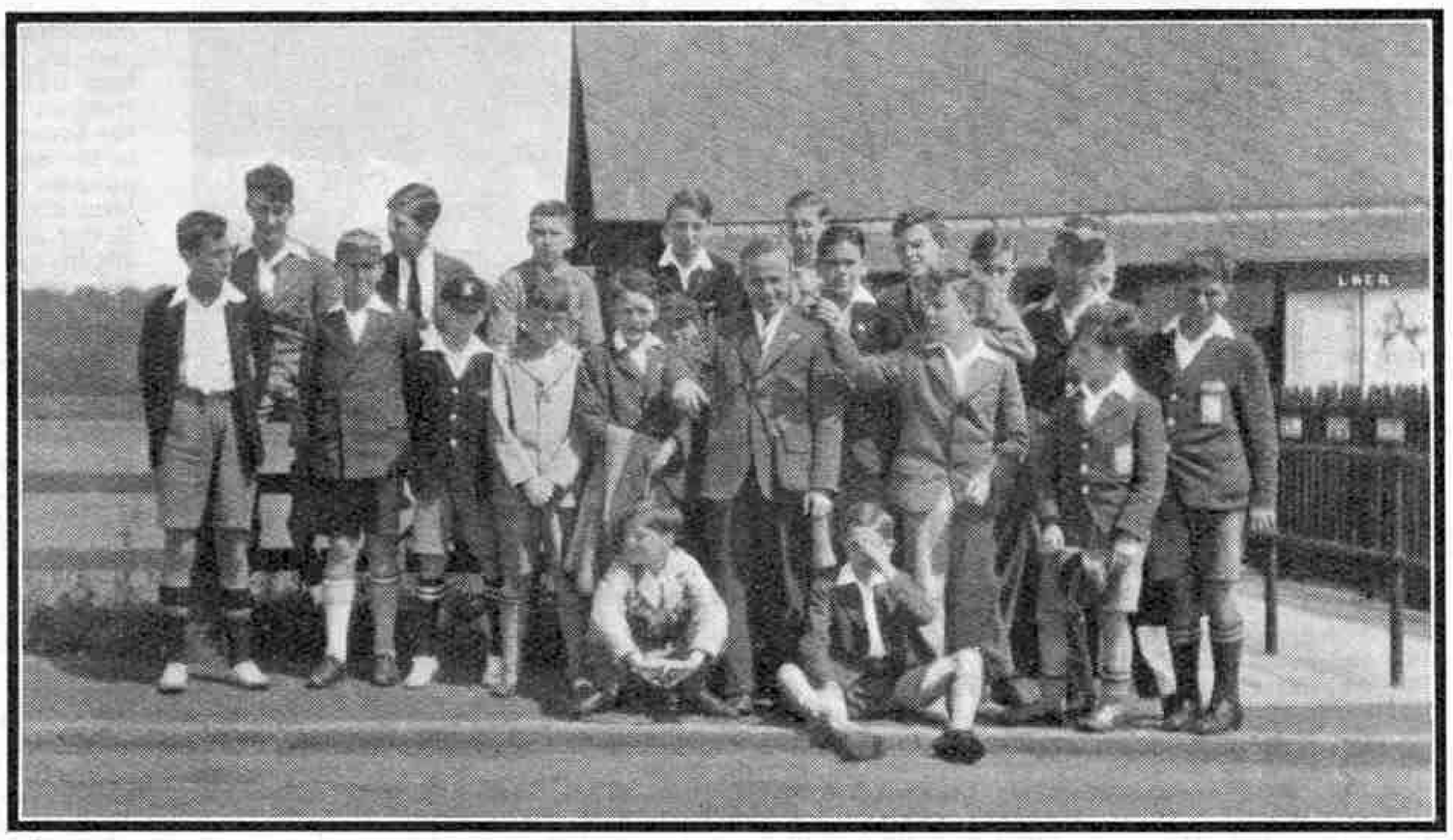
South Parade Modern School (Cleckheaton) M.C.—Enjoyable meetings are devoted to Model-building, Electrical Experiments and the construction of accessories for the Hornby track. Members of a Crafts class in the school have built a locomotive shed. At a well attended Exhibition Lorries, Tank Locomotives, Railway Bridges and other models built by members were on view, together with a large Hornby train layout and a Funicular Railway, kindly lent by a local Meccano dealer. Club roll: 24. *Secretary:* K. Walker, 12, George Street, Cleckheaton.

Glendale College M.C.—Throughout last winter a series of Model-building Competitions was held. Marks were awarded to all entries and the three members gaining the highest marks were awarded prizes. Construction of a Hornby Railway layout has been begun and special preparations have been made for the Annual Exhibition, including the construction of fencing for the miniature railway. Club roll: 31. *Secretary:* D. Lake, "Churston," 17, Meadway, Westcliff-on-Sea.

Islington M.C.—Steady progress is reported by this newly formed club, members of which are delighted with the grant of affiliation. Model-building and aeroplane construction have been the chief features of the meetings, at which games also have been played and Lantern Lectures given. Other attractions have included a Social Evening, at which a Cinematograph Exhibition was given; a Hobbies Night, when a Shadowgraph aroused great interest; and a Blindfold Model-building Contest. An attractive summer programme is being arranged and a club bank has already been formed in order to enable members to save the necessary funds. Club roll: 13. *Secretary:* M. Thorpe, 59, Onasburgh Street, London, W.C.

St. John's School (Bridgwater) M.C.—In a special Model-building effort members submitted excellent entries for criticism and review. The varied attractions of the regular meetings have included Morse Code practice, Games Tournaments and Cinematograph Displays given by a friend of the club. Other Cinematograph Shows have been presented by a member, whose projector was skilfully repaired at one meeting. Club roll: 13. *Secretary:* L. R. Temple, 46, Monmouth Street, Bridgwater.

Macclesfield Grammar School M.C.—The club's Exhibition was visited by many parents and members, who were greatly interested in a Motor Chassis, a Marine Engine, a Mill Engine and other models constructed by members. The Ship Coaler loaned by Meccano Ltd. and an extensive Hornby Train layout were greatly admired. Mr. S. R. Jones, Leader, and a party of members, visited Liverpool, where they made a tour of the docks before inspecting the Meccano Factory, where they were entertained to tea to conclude an enjoyable day's outing. Club roll: 15. *Secretary:* D. Warburton, 57, Church Street, Marple, Nr. Stockport.



Our photograph of members of the St. Giles' Cathedral (Edinburgh) M.C., with Mr. R. Croall, Leader, was taken during an enjoyable excursion to the Naval Dockyard at Rosyth. This club was affiliated in October, 1928, when it was known as St. George's (Edinburgh) M.C.; and it acquired its present name last year on becoming associated with the St. Giles' Cathedral Club. Great activity and enthusiasm mark club proceedings and the chief difficulty is that of accommodating all those who wish to join.

Exeter M.C.—Great model-building activity continues to prevail and special interest is being taken in a gigantic model of Buckingham Palace. When completed this will be more than 6 ft. in length and every member of the club is taking part in its construction. A model of the Coronation Chair also is being made as part of the club's celebration of the King's Silver Jubilee. Members continue to build models for entry in the competitions announced in the "*M.M.*" The club has now completed its 17th year and to-day is stronger and more active than at any previous time in its history. Club roll: 41. *Secretary:* M. D. Legg, 25, Chute Street, Exeter.

St. Giles' Cathedral (Edinburgh) M.C.—Interest is maintained at a high level by the introduction of novel features in the programme. Talks on "*Famous Schools*" continue to be given by Mr. R. Croall, Leader, and a variety of contests, chiefly of the "pencil and paper" type, are organised on Competition Nights. Cinematograph Shows and Social Evenings have been held. Great success attended a Visitors' Night, one of the chief attractions of which was a Handball Match between teams consisting of members and their fathers, and it is reported that in certain instances opportunities of paying off old scores were eagerly seized! Refreshments helped to make the evening pass pleasantly and the visitors were impressed by their glimpses of club life. Club roll: 165. *Secretary:* H. W. Govan, 18, Ravelston Park, Edinburgh, 4.

Claremont Avenue M.C.—Four sections have been formed, and are known by the unusual names of "Lorry," "Locomotive," "Motor" and "Crane." Model-building Contests between the sections are held regularly and the activities include Drawing Competitions, Cinematograph Entertainments and Games in which aeroplanes and searchlights are used. Sectional rivalry extends to operations on the Hornby Train layout, each member endeavouring to gain points for his team by displaying ability in carrying out the duties allotted to him. Club roll: 22. *Secretary:* G. Turton, 5, Brookfield Crescent, Kenton, Middx.

John Gulson Senior Boys' School (Coventry) M.C.—The club's Exhibition included a display of Pit Head Gear, an Excavator, Automatic Swingboats, a representation of Sir Malcolm Campbell's "*Blue Bird*" and other models in addition to a Hornby Train layout, and the interest aroused led to the enrolment of several new members. Each member of the club is required to contribute to "*Nuts and Bolts*," the club magazine. Meetings devoted to Table Tennis and other games are eagerly anticipated by members. A visit has been paid to the L.M.S.R. Goods Yard, Coventry. Club roll: 15. *Secretary:* T. Chappell, Kinbrae, 8, Troughton Crescent, Coventry.

Sid Vale M.C.—The New Year's Party was as enjoyable as previous events of this kind. The club room was decorated for the occasion and music was kindly supplied by Mr. Eveleigh. The subjects of Model-building Contests have included Aeroplanes, Steam Engines and representations of animals. Members showed great skill in reproducing the characteristics of a varied assortment of creatures in the last-named Contest, the winning models representing a Crocodile, a Donkey and a Cow. Entries in a further Contest included an excellent series of ship models representing all types of sailing ships, merchant vessels and battleships. Club roll: 25. *Secretary:* R. Gliddon, Sheffield House, Sidmouth.

CANADA

Toronto Central Y.M.C.A. M.C.—The club has now celebrated its second birthday and continues to make excellent progress. Meetings are conducted by the President, who is elected by members, and the Leader acts in an advisory capacity. Model-building continues to be the chief activity and Meccano models were used to good advantage by J. Smith, the club's engineering expert, in interesting talks on his hobby. The club took part in an Exhibition arranged by the Toronto Meccano Club Council, at which 42 models were displayed in addition to a Hornby Train layout, and a Cinematograph Show was given. Members also built models for entry in the Meccano Contest included in the syllabus of the Toronto Central Y.M.C.A. Hobbies Show. Club roll: 11. *Secretary:* B. Moore, 141, Albertus Avenue, Toronto, Canada.

EGYPT

Cairo M.C.—This newly formed club has now secured affiliation and meetings are being held regularly for Model-building and other purposes. An excellent club room has been secured and visitors interested in Meccano are welcome. Several new members have already joined the club after friendly visits of this kind. Club roll: 13. *Secretary:* Mohamed Kamel Salem, 14, Bibars Street 14, Hamzaui, Cairo, Egypt.

NEW ZEALAND

Christchurch M.C.—A talk on "*Metals*" by Mr. R. A. Handisides, Leader, and a Lecture on "*The Production of a Newspaper*," by Mr. Staples of the "*Christchurch Times*," have been popular features of the recent programme. Other meetings during the summer have been devoted to Games and Visits, and an enjoyable picnic on the banks of a river near Christchurch also has been held. To the regret of members Mr. Handisides has been compelled to resign Leadership of the club after occupying this position for five years. Club roll: 25. *Secretary:* L. W. Best, 28, Circuit Street, Elmwood, Christchurch, New Zealand.

Largest Ice Factory—(*Continued from page 271*)

housed heat exchangers and the condensing plant, together with the water circulating pumps. The heat exchangers take up heat set free by compression and condensation of the ammonia, and serve the dual purposes of oil separators and heaters for the water that is used to free the ice slabs from the tanks. The ammonia gas is delivered by the compressors first to these exchangers, where any lubricating oil is cooled and separated, and falls into a collector welded to the underside of the device. It then passes into the condensers, where it is compressed and cooled by means of running water. There are 15 condensers, with shells welded by means of a water gas process and the connecting tubes electrically welded into the shell; and the end covers are readily removable to give access to the water tubes for cleaning purposes. The necessary water is supplied by five pumps, each of which delivers 54,000 gal. per hour. These pumps are of gun-metal and are of the centre suction type, with casings that can be opened so that the impellers can be examined and withdrawn if necessary without in any way disturbing the connecting pipes and valves.

The liquid ammonia passed out of the condenser on its way to the evaporator naturally is at the temperature of the circulating water, and must be cooled to the temperature in the evaporator before the liquid can do effective work. This is brought about by what is known as primary evaporation, and the pre-cooling of the liquid ammonia is carried out in an intermediate vessel in which a portion of the liquid itself is evaporated. Thus the ammonia lowers its own temperature, and greater efficiency is obtained in the evaporation proper. The liquid ammonia is cooled in this manner to a temperature of from 20 deg. F. to 25 deg. F., the flow of the liquid being controlled by two float valves, which are probably the largest ammonia float valves in the world.

There are two primary evaporators, in which this pre-cooling takes place. These are large steel vessels of welded construction throughout, and are heavily insulated. The gas formed in them by evaporation of part of the liquid ammonia is drawn off into the higher pressure suction line for return to the compressors, and sub-cooled liquid from them is supplied to pre-coolers, in which the temperature of the water that is used to fill the ice-making tanks is lowered to 33°F. They are situated on top of one of the transformer stations, at a height sufficient to allow the liquid to flow by gravity to the various ice tanks; and the cooled water is delivered at the rate of 70 tons an hour to a central distributing tank on the roof of one of the factories, from which it flows by gravity to the filling stations of the five ice tanks.

Along the top of each evaporator or cooler runs a long rising suction main, and both suction and liquid mains are connected to the top and bottom respectively of a large vertical trap, the liquid level being controlled by a float type regulating valve. The valve is connected to the side of the trap, and the main suction to the machine room is led away from the top. These float regulating valves are of the Liverpool Refrigeration Company's own design and manufacture, and are remarkably sensitive.

Each of the ice-making tanks has two coolers, which are built in sections on account of the length required, and are fed by inlet pipes passing through the side of the tank. In the tanks are heavy galvanised ice moulds. The water to be frozen flows into these, and is cooled by the brine as this liquid circulates backward and forward between the evaporators and the tank. When ice is formed, the block is freed by bringing the mould into contact with warm water from the heat exchangers already referred to. This thaws a thin layer of ice in contact with the inside of the mould, and the block can then be tipped out.

Some idea of the efficiency of this fine plant can be formed from the fact that during two recent months the factories' approximate output was 5,000 tons per week. With all eight factories on full output the company can now manufacture over 1,000 tons per day, and as their yearly sales amount to over 220,000 tons, they claim to be the largest producers of artificial ice in Great Britain.

Fastest Newspaper Train—(*Cont. from page 290*)

were at the bottom, 150 ft. below the surface of the Bristol Channel. We were rising. The running was perfect. "Best bit of track on the system," I was told later; and I believe it. We rose to the surface, high and dry. The lights of Newport ahead. Should we do it?

A slight jar—we were there at 3.36 a.m., one minute early in spite of the three checks and the three minutes' delay. Black figures stormed the coaches and out came hundreds of our two-thousand packages, to be trundled off on barrows to waiting trains and cars. There, we detached a coach, and soon were on our way again.

Marshfield—a dead stop—a precious two minutes lost. And yet we made Cardiff "on time." More frenzied work, four coaches detached, and we found ourselves on the last stages of our journey.

How the line twisted and turned. How well the enginemen knew the road and worked together in picking out their signals. At every stop, waiting porters and boys, perhaps not quite enthusiastic at having to get up 25 minutes earlier than before, were hot on the job all the same.

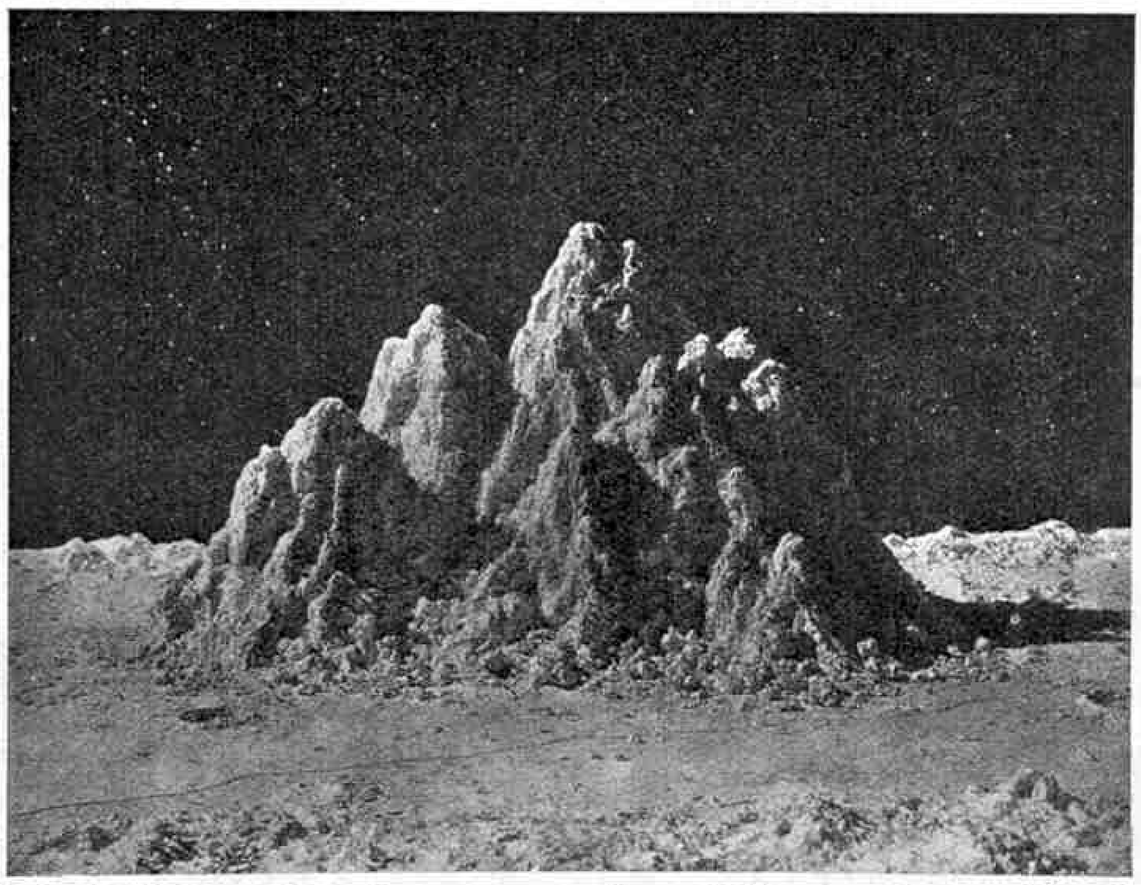
Down the long slope we coursed to Swansea, which was patterned below as with thousands of fairy lamps, round the curve, and then a dead stop within an ace of our goal, to let the "Up Fishguard Boat Express"—running a little late—go by. Foiled—but only just. Swansea at 4.45—one minute late in our 191 miles' dash through the night.

We are indebted to the courtesy of the Editor of the "*Great Western Railway Magazine*" for permission to reprint this interesting article.

Intelligence of Plants—(*Continued from page 267*)

pods which, when ripe, burst and expel the seeds with considerable force.

Plants are dependent on the visits of certain insects to effect the exchange of pollen that is a vital part of their fertilisation. It is important, therefore, that the plants should have some means of attracting these important visitors, and one way of doing this is by showing brilliant colours. The conspicuous bright lines on the petals of the iris, for instance, not only add greatly to the beauty of the flower, but also act as guides to the insects seeking the nectar.



A drawing by James Nasmyth, the famous engineer, of Pico, one of the mountains of the Moon, as it would appear to a visitor to our satellite. Our illustration is from "Through Space and Time," by Sir James Jeans, which is reviewed on page 301, and is reproduced by permission of Mr. John Murray and the Cambridge University Press.

Truck made with Meccano—(*Cont. from p. 311*)

between the gear-box and the road wheel. The jockey sprocket consists of a ¾" Sprocket Wheel mounted on a Pivot Bolt secured in the end hole of the web of a Crank. The Crank pivots about its boss, and is provided with a Tension Spring, by means of which the Sprocket is held in contact with the main driving chain to the road wheel. The front wheel is suspended from leaf springs with shackles made from Double Brackets.

It was impossible to use real hydraulic mechanism in the model and therefore a system of levers was used. This mechanism is housed between a 2½" × 1½" Flanged Plate and a number of Strips, and consists of a Rod bent into the form of a crank. The Rod is journalled in the Plate and Strips, and carries a Ratchet Wheel. To raise the platform the Ratchet Wheel is rotated by means of a Pawl attached to a hand lever, which is pulled to and fro. A second Pawl fitted to the Plate holds the Ratchet Wheel in position during the return motion of the lever, and the Crank is connected by a simple series of levers to the underside of the lifting platform. To lower the platform the hand lever is operated until the Crank reaches its top dead centre, when the platform falls down.

New Meccano Models—(*Continued from page 307*)

Girders are joined by a Trunnion to the apex of which the sheer-legs are pivoted.

The luffing cord is tied to a 1½" Strip on a Rod that passes through the vertical Angle Girders, and is then passed round a 1" Pulley connected to the jib by Strips, and back over a Pulley on the Rod of the 1½" Strip. It is finally tied to a 3½" Rod, journalled in the Sector Plates and carrying a Bush Wheel fitted with a Threaded Pin to form a hand wheel.

Parts required for Derrick Crane: 10 of No. 1; 12 of No. 2; 2 of No. 3; 6 of No. 5; 2 of No. 6a; 2 of No. 8; 6 of No. 10; 1 of No. 11; 10 of No. 12; 2 of No. 12a; 1 of No. 16; 2 of No. 17; 4 of No. 18a; 2 of No. 19b; 1 of No. 19s; 1 of No. 22; 2 of No. 22a; 1 of No. 23; 1 of No. 24; 13 of No. 35; 60 of No. 37; 6 of No. 37a; 3 of No. 38; 2 of No. 40; 1 of No. 44; 1 of No. 48; 1 of No. 48a; 1 of No. 52; 2 of No. 54; 1 of No. 57; 6 of No. 111c; 1 of No. 115; 1 of No. 126.

Capturing an Okapi—(*Continued from page 295*)

not even suspected popped out of the bushes and ran away. A bird call over my head made me look up. There on the branches of a big tree was Lumalese on guard. Following his gesture I walked around the enormous trunk and only then could I understand how the capture had been made.

Among the monumental roots the little stream had formed a cool, limpid pool in which "Beautiful" had thrown himself on his back, pawing the air and noisily splashing, so noisily as not to hear the two men approaching and hiding themselves behind one of the roots. Seizing the right chance, Lumalese, quick as lightning, slipped a rope through the loop tied around the animal's neck, while Kunabo tied the end of the rope around the tree. Then one had run to call me while the other sought refuge on the high branches from the fury of the okapi.

In his effort to free himself "Beautiful" had pulled so strongly on the rope that his breath was beginning to be cut off, and when with a wild lunge he tried to charge me, the rope jerked him back so violently that he was thrown on the ground. Half an hour passed during which we managed to put two other ropes around his feet so as to be able to loosen the rope around his neck. Then, when he had just recovered his breath and was about to get to his feet, a great rolling of thunder passed in the sky. Only then I noticed that the forest had grown even darker than usual and that a particularly violent storm was rapidly approaching. I saw the animal sniff the air, look around, and then without any apparent reason throw himself down again.

"He dies," murmured Kunabo.

But "Beautiful" and I had understood each other. To be a prisoner in the pit, to be surrounded by all those odours and noises; not to eat and not to drink, palisades and shouts, ropes at his neck and his legs—nothing had frightened him. But to have to begin that fight for freedom all over again in the teeth of the coming storm; to have to continue it in the disgusting mud in which in a few minutes the whole forest would transform itself—this was too much for him. Better give up the fight and let himself die, his eyes seemed to tell me with their sad, resigned expression.

"Leave him here until to-morrow, *Bwana*," said Kunabo. "Tied up like that he cannot run away."

It would have been easy then for me to tie the animal up securely and put him on the stretcher. But the storm, which stupefies the native completely, was on us and it was utterly impossible to think of transporting him to the base camp that day. Perhaps on the following day I could have found him there still alive. But to leave him for a long afternoon of torrential rain, a long night of misery—I couldn't do it.

So I made a decision which seemed to me then more than natural. Slowly I approached "Beautiful," talking to him constantly in a soothing voice. He made an effort to get up or to kick me, but once more he seemed to understand, and quieting down remained almost motionless. Caressing his head with my left hand, with the other I cut the three ropes. The okapi gave a jerk, understood that no resistance impeded him. He was free! Before I could retreat for a distance of more than two paces he was on his feet, his face resuming that implacable savage expression.

Blocked as we were between two walls of thick vegetation in a narrow elephant path, his only way out was past the spot where I stood. For a second I thought I was in a bad position, but "Beautiful" knew better. Turning to the right he crashed through the vegetation as if it didn't exist, passing by chance or by fear, or who knows perhaps by gratitude, a good two yards from me.

Under the now unchained fury of the storm my natives stood, marvelling, at a short distance from me.

"To the camp," I ordered.

"*Ndio* (yes), *Bwana*," they replied in low voices, and one by one they followed behind me.

The *Bwana* had let go the okapi that for so many months he had been trying to get; working so hard and making them work so hard. What the whites do and think it is useless to try to understand.

So, I know, they were thinking. To-morrow, I might be thinking the same. But now, as I plodded along through the mud, I was thinking only of "Beautiful," galloping straight and free before the great curtain of the advancing rain.

Speedometers for Cyclists

Readers who love cycling for the sake of the sport, and do not regard it merely as a means of getting from one place to another, will find their pleasure greatly increased by fitting a speedometer to their machines. A ride is far more interesting when one knows one's speed at any moment, up hill or down, or on the level.

A speedometer for bicycles has been specially designed by our advertisers The Cooper-Stewart Engineering Co. Ltd., who will send free an illustrated folder describing this interesting instrument to any reader who writes to them at Dept. 56, 136, Long Acre, London, W.C.2.

Branch News

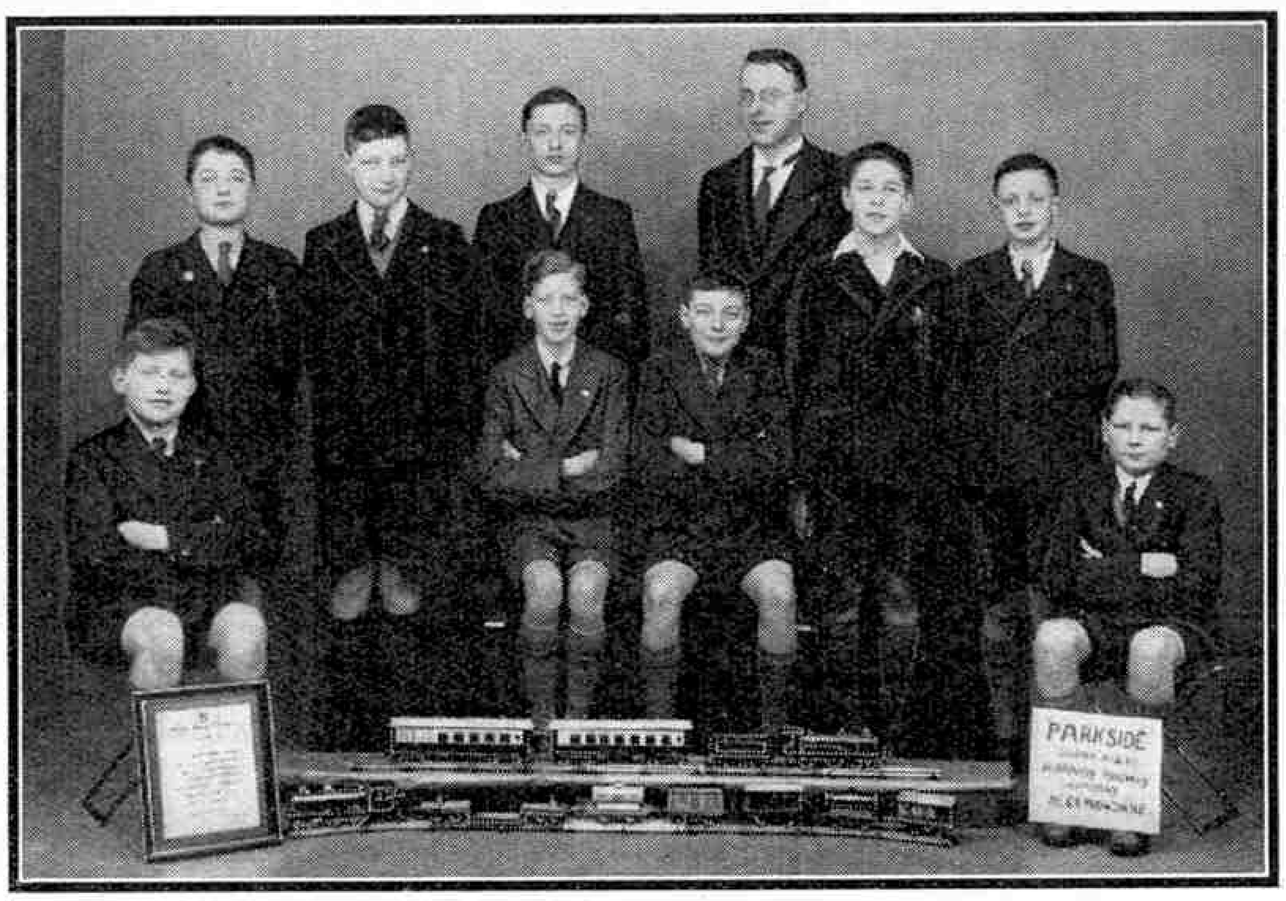
NEW SOUTHGATE.—Operations have now been transferred from a temporary room to a garage in which electric lighting is installed. A more satisfactory permanent track has been laid down and track meetings, competitions and entertainments are being arranged regularly. A Lantern Lecture on *"The Railway Museum at York"* was greatly appreciated, and members enjoyed the slides, which were kindly loaned by the L.N.E.R. Extensive preparations were undertaken for the Branch Exhibition, and members prepared posters, handbills and tickets in order to advertise the event as widely as possible. Secretary: A. R. Wardle, 25, Limes Avenue, New Southgate, London, N.11.

GLENGORSE (BATTLE).—Regular track meetings are being held and a favourite occupation is comparison of the hauling powers of members' locomotives. Goods yards operations are frequently practised, and special regulations of a railway-like character have been worked out and are strictly kept during operations of this kind. Excursion trains are run on the Branch track in emulation of similar trains arranged on real railways for important events. An excellent Conjuring Entertainment has been given by members and the Branch took part in a school Concert. Secretary: A. G. Forsyth, Glengorse, Telham Court, Battle.

WARDEN HOUSE (UPPER DEAL).—The Branch track has been greatly improved and is now double, with ample sidings. The locomotives brought to meetings by members include a *"Royal Scot,"* a *"Flying Scotsman"* and a *"Riviera Blue"* locomotive. Members are given special tasks at track meetings and instructive and enjoyable running is being secured. Secretary: H. M. Anderson, Warden House, Upper Deal, Kent.

PARKSIDE (HECKMONDWIKE).—An excellent track has been built from material lent by members, and track meetings show great promise. Operations have been improved by carefully thought out alterations to the layout, based on experiments. Lantern Lectures have been given by the Chairman and a Cinematograph Show has added to the enjoyment of members. In an interesting competition members were asked to draw the H.R.C. badge, the winning entry being converted into a label for the Branch storage box. Secretary: R. Crook, "The Laurels," Leeds Road, Heckmondwike, Yorks.

BON ACCORD (ABERDEEN).—The Branch track has been improved by the inclusion of cuttings, fields and appropriate scenery, and cork ballast has been laid down between the rails. Electric lighting has been introduced in signal cabins, stations and goods yards, and also on a viaduct built from Meccano parts that is now included in the layout. At a special meeting a single line was worked with the aid of a tablet changing device designed and constructed by a member. A Library has been founded and sections have been formed for Meccano Model-building, Games, Cycling and other sports. Secretary: J. S. Rowand, 1, Adelphi, Aberdeen.



A group of members of the Parkside (Heckmondwike) Branch, No. 283, with Mr. G. D. Mott, Chairman. This Branch was only incorporated in February of this year, but has made excellent progress, and many enjoyable track meetings have been held with experimental layouts. Lantern Lectures, Cinematograph Shows and Railway Competitions also are included in the programme.

HOLLANDERS (SPALDING).—Passenger and goods services are arranged regularly on the Branch track, to which a new siding has been added. Speed Contests also have been organised and a special speed duel was fought out between two members. A Railway Photograph Collecting Section has been formed and special facilities are given at meetings for the exhibition of photographs collected by members. Secretary: R. Sparling, 4, Gore Lane, Spalding.

ADDISCOMBE.—Meetings at present are being held at the homes of members and tracks designed to give variety in working are being laid down. A particularly complicated layout was used at one meeting in order to test members' capabilities in shunting, signalling and other duties. An enjoyable Exhibition included a Cinematograph Show, Supper and Competitions, and prizes were awarded for the best exhibits displayed by members. Games meetings have been arranged and members had a splendid time during a visit to Paddington Station, where special interest was displayed in the working of signals. Secretary: G. Chandler, 62, Ashburton Avenue, Addiscombe, Croydon.

AUSTRALIA

SYDNEY.—Steady progress is being made with track working and the usual activities. An excellent lecture has been given by Mr. H. H. Matthews, Chairman, on *"Railway Practice."* Mr. Hartigan, Railway Commissioner for New South Wales, visited the Branch to give a lecture on the State Railways. A tour has been made of an Ice Cream Factory, and Mr. L. Ison of the Melbourne M.C. has been a welcome and interesting visitor. Secretary: W. J. T. Watson, 595, Parramatta Road, West Leichhardt, N.S.W., Australia.

Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given below. All owners of Hornby Trains or accessories are eligible for membership and the various secretaries will be pleased to extend a warm welcome to all who apply.

CHELTENHAM—Mr. J. Clifton Wade, 62, The Strand, Cheltenham.

FELTHAM—A. Cassely, 117, Staines Road, Feltham.

HALIFAX—B. Spencer, 11, Willow Field Road, Burnley Road, Halifax.

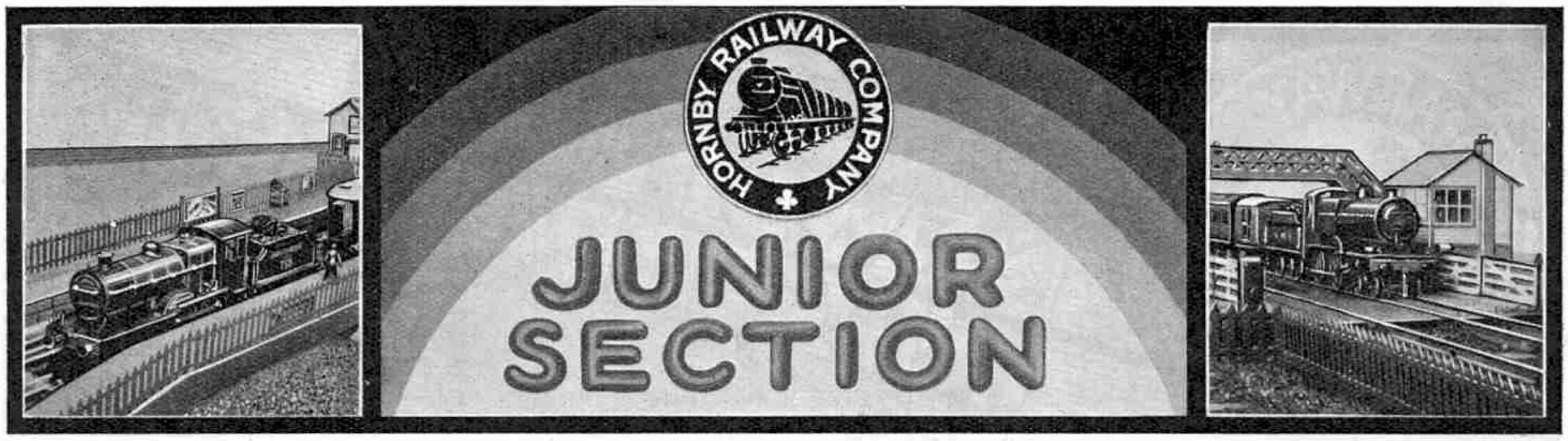
REDHILL—D. R. Wilkins, 147, Brighton Road, Redhill.

SOUTH AFRICA—A. Payne, Umzinto Rail, Natal, S. Africa.

Branches Recently Incorporated

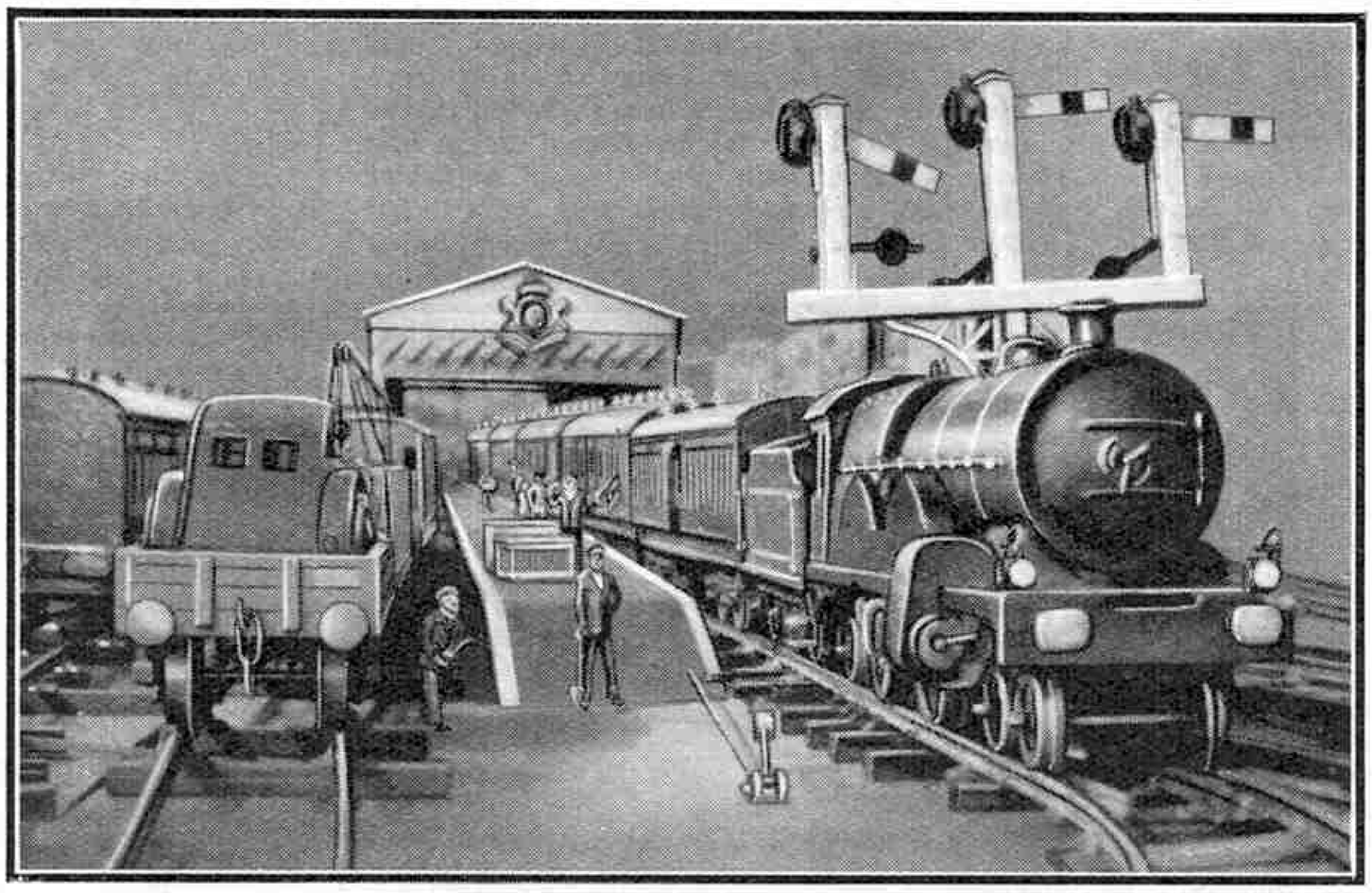
283. PARKSIDE—R. Crook, The Laurels, Leeds Road, Heckmondwike.

284. NORTHAMPTON—T. F. Fry, 39, St. Matthew's Parade, Northampton.



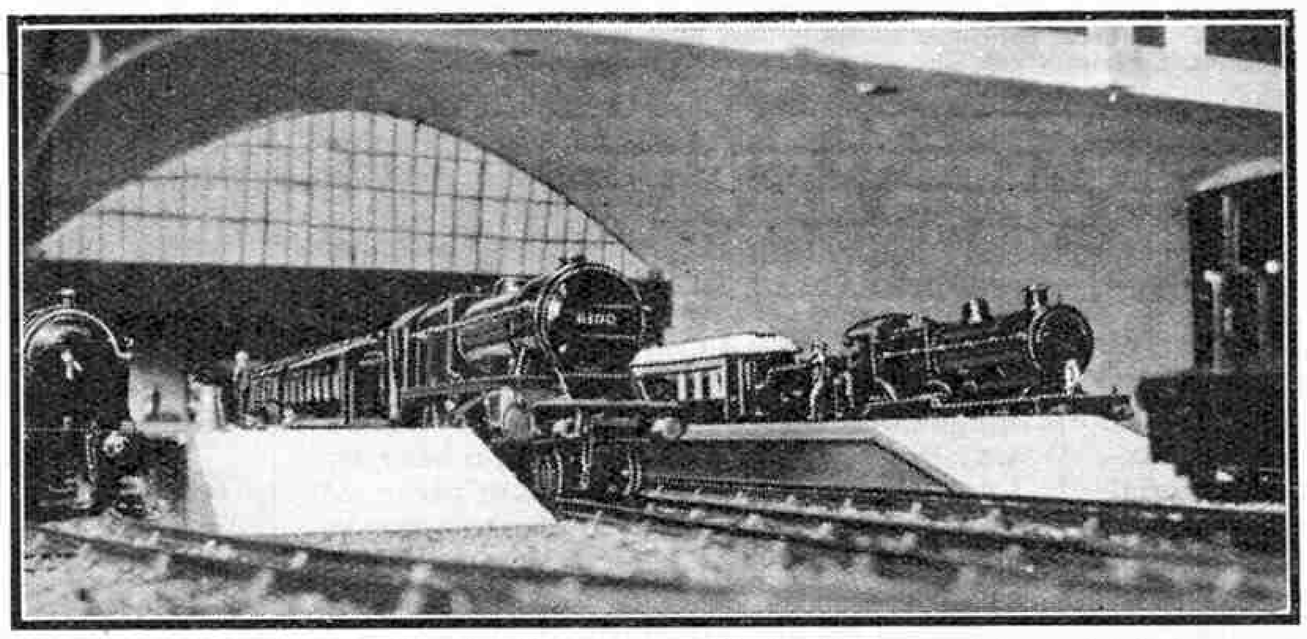
INTERESTING LAYOUT FEATURES

CORRESPONDENCE between H.R.C. members and Headquarters on all kinds of railway topics, real and model, is regular and heavy, and of all the subjects dealt with, probably the most discussed is the design and operation of miniature railway layouts. Frequently we receive descriptions of interesting systems from their enthusiastic owners, and when these are likely to be of use to "*M.M.*" readers generally, they are referred to in these pages. Sometimes the actual plan of a system is its chief merit; at other times it is the operations carried out, or the realism of the equipment and accessories that makes the railway worthy of attention.



An express train on the layout of D. J. M. Thorne of Upminster. A feature of this line is the operation of trains representing the principal services of all four groups.

Most miniature railways are handicapped by the lack of space and this severely restricts the schemes of extensions that invariably form in the mind of the enthusiastic General Manager. It is necessary, therefore, to make the most of what space there is, yet without crowding the line to such an extent that operations on it are made difficult. The diagram on page 319 shows a layout which, for the relatively moderate amount of equipment required, affords very interesting train working. This is operated successfully by R. L. Rowett of Snaresbrook, E.11. It consists primarily of a formation of which one corner has been altered in shape in order to allow of the opening of the door of the room in which the railway is situated. Otherwise it follows the walls of the room. In the main circuit is contained an oval formation made by the loop line "X." This line is joined, in addition, with the upper and lower parts of the plan by the connections "Y" and "Z." Another connection leads to an island-platform station served by the two tracks into which the single line resolves itself by means of Parallel Points.

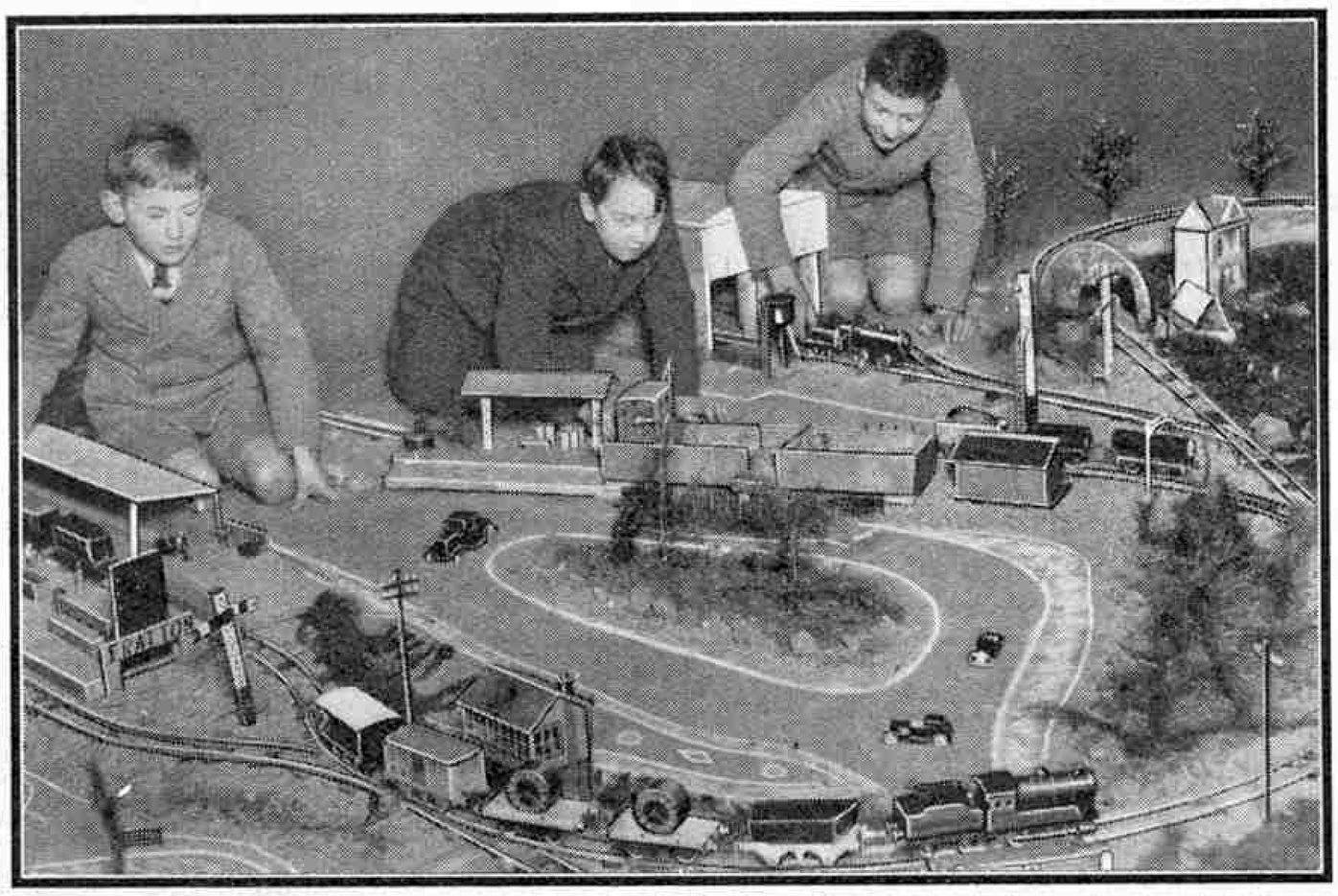


A busy terminal station on the layout of P. Woodman of Exeter. The unusual view-point of the camera gives the locomotive in this photograph a very imposing appearance.

Some very fascinating operations are possible, for a train starting from this terminus may take a variety of routes in succession and then return to the starting point, which then becomes the arrival station. Passing stations are located in two places, so that wayside work can be carried out by stopping trains in the appropriate manner, and a host of entertaining movements are possible. In addition to terminal working, long non-stop runs can be carried out if required, owing to the continuous nature of the main track. This combination of possibilities renders the layout a useful one, although its design is really simple, and the number of rails required is moderate, so that it will appeal to junior enthusiasts.

Equally interesting in another respect is the layout of which part is shown in operation in the upper photograph on page 319. This is a co-operative effort on the part of several boys. Operations here have been

planned in order to reproduce the working of the Portsmouth district of the Southern Railway, with which the owners of the system are familiar. A notable point is that more attention than usual has been given to the incorporation of realistic lineside effects and scenery. This part of the model railway hobby is somewhat neglected, chiefly on account of difficulties which, in the end, are usually found to be imaginary. We have frequently pointed out that elaborate details are not necessary for correct effects, and the photograph in question shows that simple equipment, well arranged, gives a far more pleasing result than schemes with a vast amount of unnecessary detail.



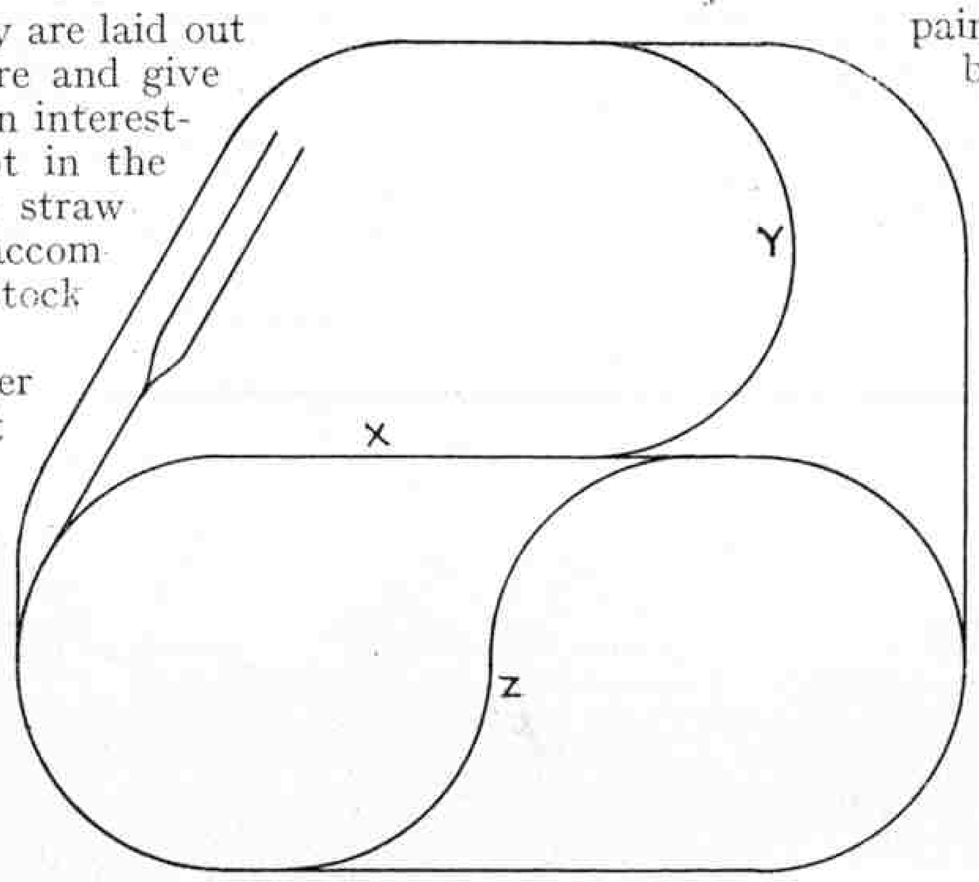
An effective miniature railway arranged jointly by the Portsmouth enthusiasts shown in the photograph. For permission to reproduce this illustration we are indebted to the courtesy of Portsmouth Newspapers Ltd.

The railway is arranged on the floor of a garage, which gives rather more scope than is usually possible in an ordinary indoor room. Thus the railway track is correctly ballasted throughout, and this always adds considerably to the finished appearance of a line. Ballast at once shows up the "railway" property as distinct from the "country" alongside. Stones and soil are used effectively in places, together with moss and pieces of fir-tree twigs, giving the correct natural surroundings. Miniature roads—with an actual concrete surface, as they are laid out on the garage floor—are a feature and give access to the various stations. An interesting point about the goods depot in the centre of the illustration is that straw filled pens are provided for the accommodation of cattle and live-stock waiting to proceed by rail.

A special feature of the upper photograph on page 318 is that it shows part of a miniature railway on which each of the four groups is represented by appropriate locomotives and rolling stock. Their chief services therefore can be reproduced satisfactorily as required. This system was fully described in the *"M.M."* for February 1934, and is operated by D. J. M. Thorne of Upminster. The layout itself is effective in design, and lineside features are incorporated wherever possible; but the actual running of the trains and the representation of services, rather than the completeness of general detail, form the chief interest. Such famous trains of to-day as *"The Royal Scot," "The Flying Scotsman,"* the *"Cornish Riviera Express,"* and *"The Golden Arrow"* can be run in turn.

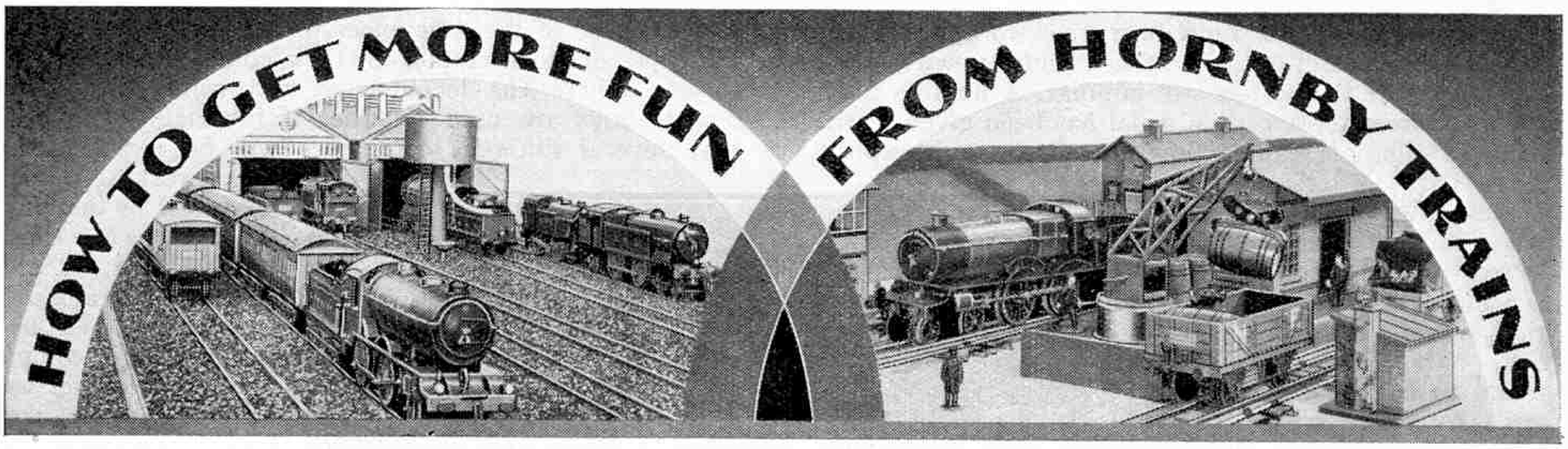
The representation of modern crack services of several or even all groups is interesting, however, if only because of the differences to be observed between the types of stock employed, their colour schemes, and so on. Where the locomotives and rolling stock of several boys are used together it invariably happens that several different companies will be represented. Joint working based on actual or imaginary services can thus be practised; or alternatively trains of each group can be run as required in the same manner as on the layout we have just considered. This type of working always appeals specially to younger enthusiasts whose individual railway possessions are limited, and who find the more advanced forms of operation, such as timetable working, rather complicated.

The lower illustration on page 318 is notable because of its realistic viewpoint. It shows the terminal station on the L.M.S.R. layout operated by P. Woodman of Exeter. On this line special attention is given to stations, and the terminus in the photograph has two island platforms, making a total of four platform faces. Part of the length of these platforms is covered by a single-span arched roof that gives a realistic appearance to the premises. This roof is merely a wood and cardboard structure, suitably painted to represent steel and glass, but is very effective. A feature of this terminus, which is not apparent in this photograph, is that station offices and other details are provided at the "town" end, and give quite a business-like air to the building generally. This type of construction is not difficult to carry out, and cardboard boxes of various sizes and shapes can frequently be converted into different kinds of buildings. Many readers enjoy making up accessories in this way, and some very realistic effects can be obtained.



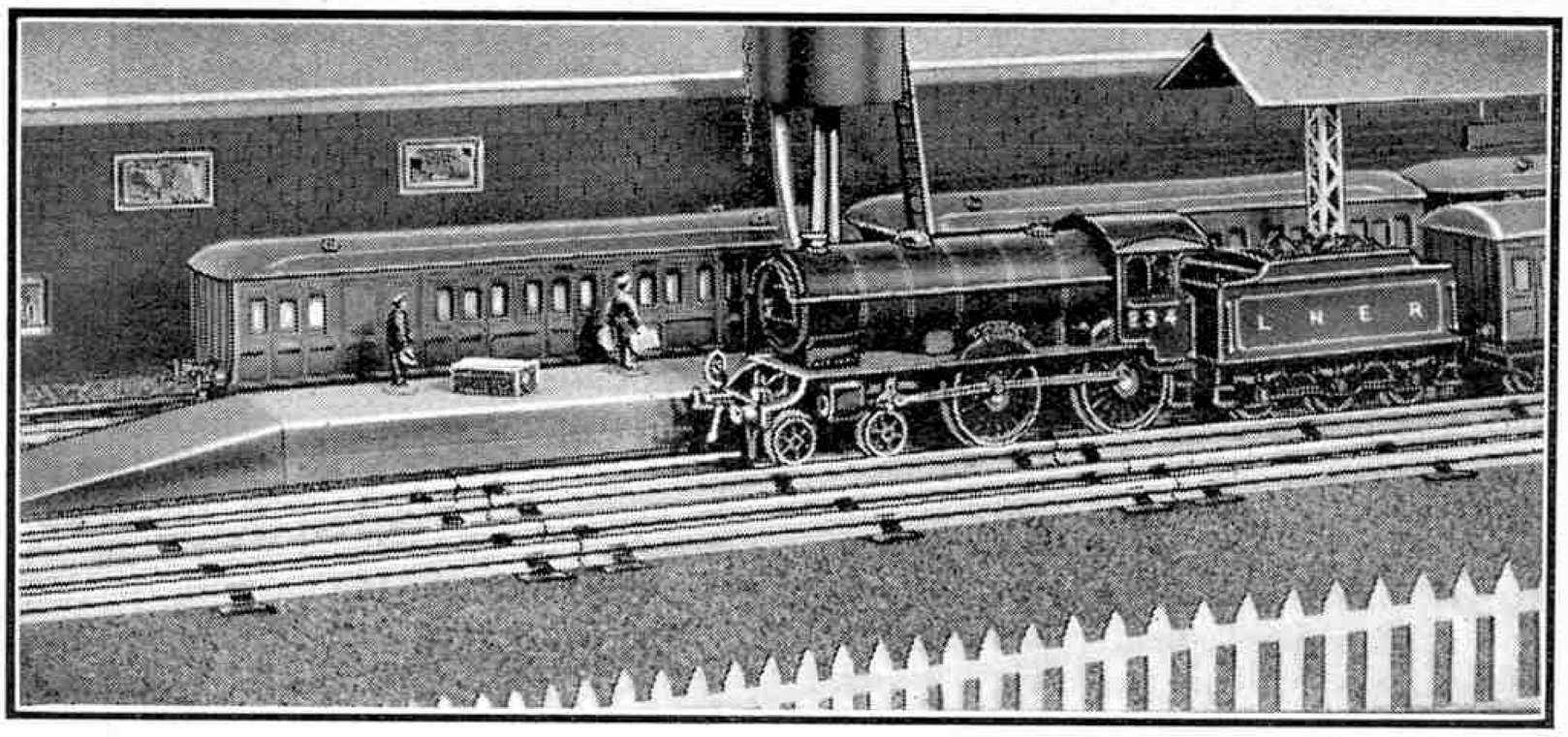
The layout plan of R. L. Rowett referred to in this article. The design allows of numerous interesting operations within quite small limits of space.

Many examples of lineside accessories lend themselves to reproduction by the use of wood and cardboard. Apart from stations, and such items as tunnel mouths and locomotive coaling stages mentioned in the *"M.M."* last month, there are special structures such as water-softening plants and goods warehouses. There are special types of buildings too that may be required for particular situations, such as overhead signal cabins. In future issues we hope to be able to give details of some examples of these accessories for use in connection with Hornby Railways.



HORNBY "NORTH EASTERN" SERVICES

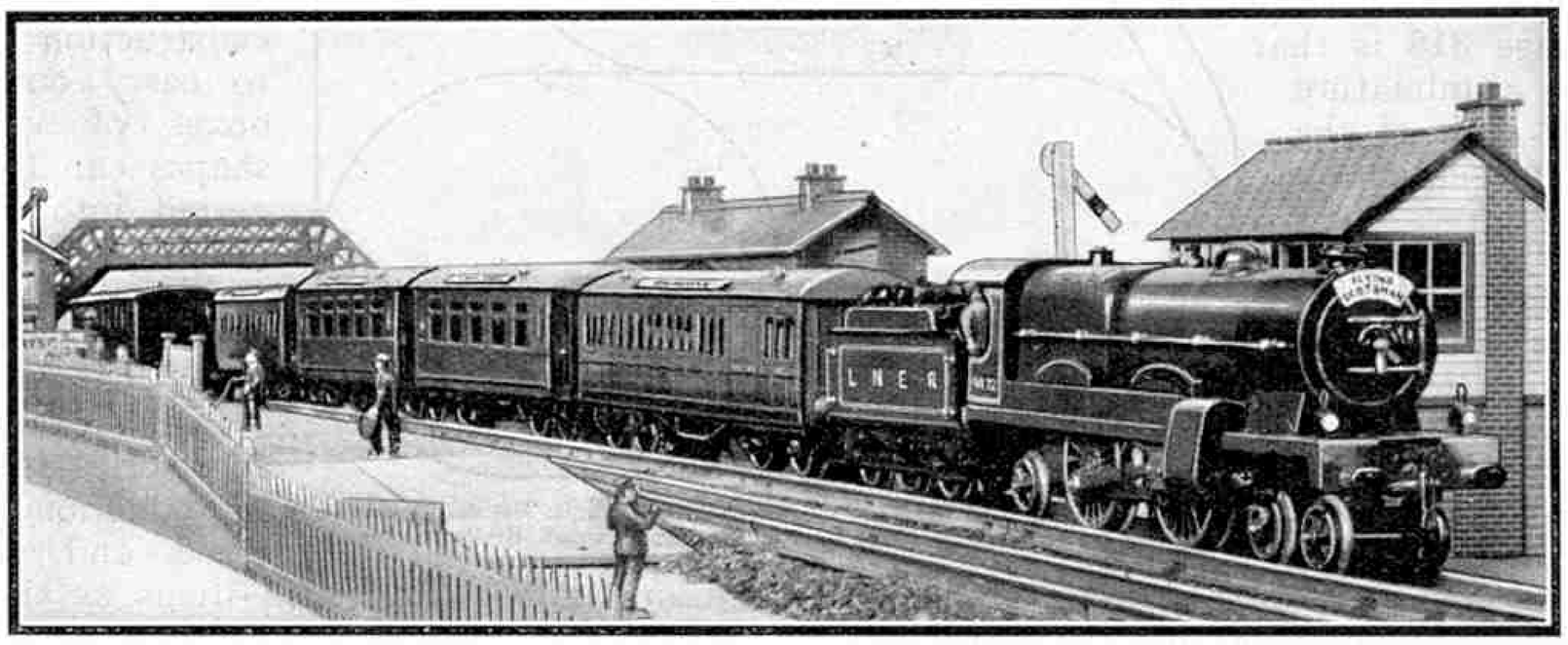
THIS month we are returning to a favourite type of article in which the practice of a real system is examined with a view to its reproduction in miniature with Hornby Railway material. The prototype selected, as a result of demands by many H.R.C. members, is the North Eastern Area of the L.N.E.R., or the districts covered by the old N.E. system. In much of the area served the North Eastern was the only railway system of any consequence, and this monopoly tended to make the general practice of the company extremely individual. In addition, the special conditions or activities of certain districts also helped to give a unique quality to many N.E. practices and this is still the case to some extent.



An island platform station on a Hornby layout. The locomotive is the well-known Hornby No. 2 Special "Yorkshire," and the coaches are Metropolitan vehicles used to represent L.N.E.R. compartment bogie stock.

On any miniature system representing the main N.E. line, an important feature of the traffic must be a series of trains based on the crack Anglo-Scottish services. The famous *"Flying Scotsman"* may therefore be operated, and also such trains as the luxurious *"Queen of Scots"* and the *"West Riding Pullman,"* for the composition of which Hornby Pullman Coaches are essential. The make-up of these two all-Pullman trains presents no difficulty. Ordinary Pullmans are available to form the main part of the train, and there are suitable Pullman Composites having guard's and luggage accommodation to form the ends. When all the vehicles are correctly vestibuled together by means of Corridor Connections the effect of such miniature luxury expresses is very fine. *"The Flying Scotsman,"* however, has a more varied composition and Hornby No. 2 Saloon Coaches will perhaps form the bulk of the train. Incidentally the Saloon Coaches can be made to carry Train Name Boards by means of the useful No. 2 Clips that are designed to suit the roofs of these coaches.

For the haulage of such a train the use of the Hornby No. 3 L.N.E.R. Locomotive of the same name is an obvious course. An interesting feature in connection with this service is that when the non-stop running between King's Cross and Edinburgh and back is carried out during the summer period, the title of the train is displayed on the front of the engine, as well as on the coach roof boards. A semi-circular white board is carried on the smoke-box front, and the words *"Flying Scotsman"* appear on it.



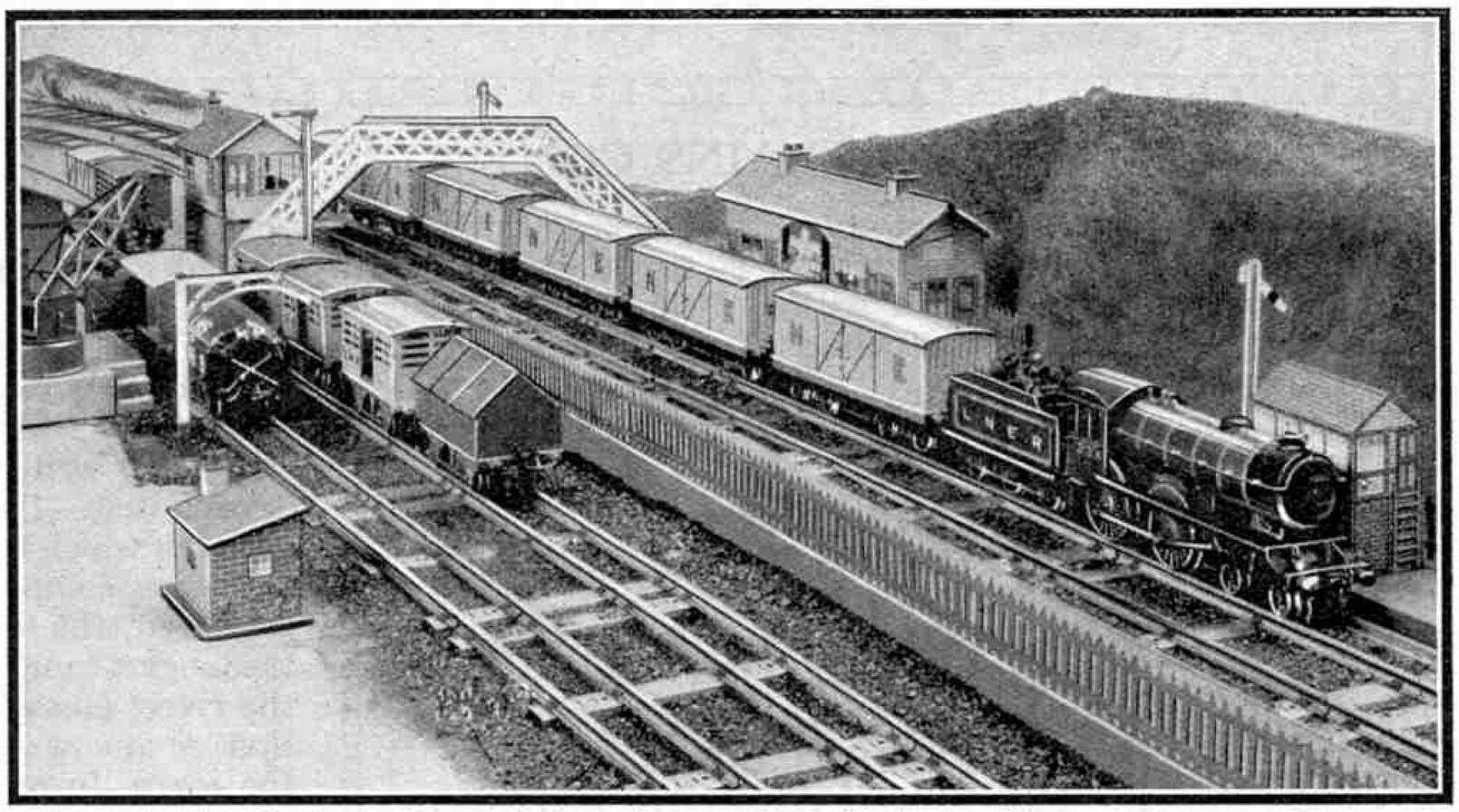
"The Flying Scotsman" express on a miniature L.N.E.R. system. The locomotive carries on the smoke-box door the special "board" bearing the train name that is referred to in this article.

In miniature the nameboard on the engine is attached to the top lamp bracket on the smoke-box door, being looped over this with a strip of stiff paper attached to the

board. The board may be easily prepared from a piece of card, and if it is marked out with a radius at the top of seven-eighths of an inch and a depth of five-sixteenths of an inch it will be found quite suitable. Sufficiently good lettering probably will be within the capabilities of most H.R.C. enthusiasts, or they may be able to persuade a friend who is skilful in this direction to do it for them. The lower photograph on page 320 shows how effective the scheme is, if neatly carried out.

For shorter-distance traffic that does not require the provision of vestibuled stock, the Metropolitan Coaches can easily be made use of if bogie vehicles are preferred. On the other hand, on most miniature railways 4-wheeled coaches such as the Hornby No. 1 Coaches are employed for local work. They save valuable space in stations and sidings, and are light in weight and can thus be easily handled by small tank engines. They are of course necessary on a line laid with 1 ft. radius curves as the longer bogie coaches cannot negotiate these rails. Whatever passenger trains we require to run, therefore, on our "North Eastern" system, we can make up without much difficulty.

Returning to the question of motive power, we recall that the "Shire" class, and their later developments the "Hunts," were designed primarily for N.E. Area services. As Darlington-built engines, they are to be found in large numbers on their "home" sections. The Hornby No. 2 Special Locomotive, which represents the pioneer "Shire," No. 234, "*Yorkshire*," is therefore necessary on any "North Eastern" line. On a miniature system it may carry out very varied duties. In addition to passenger work it may be usefully employed on fast goods trains.

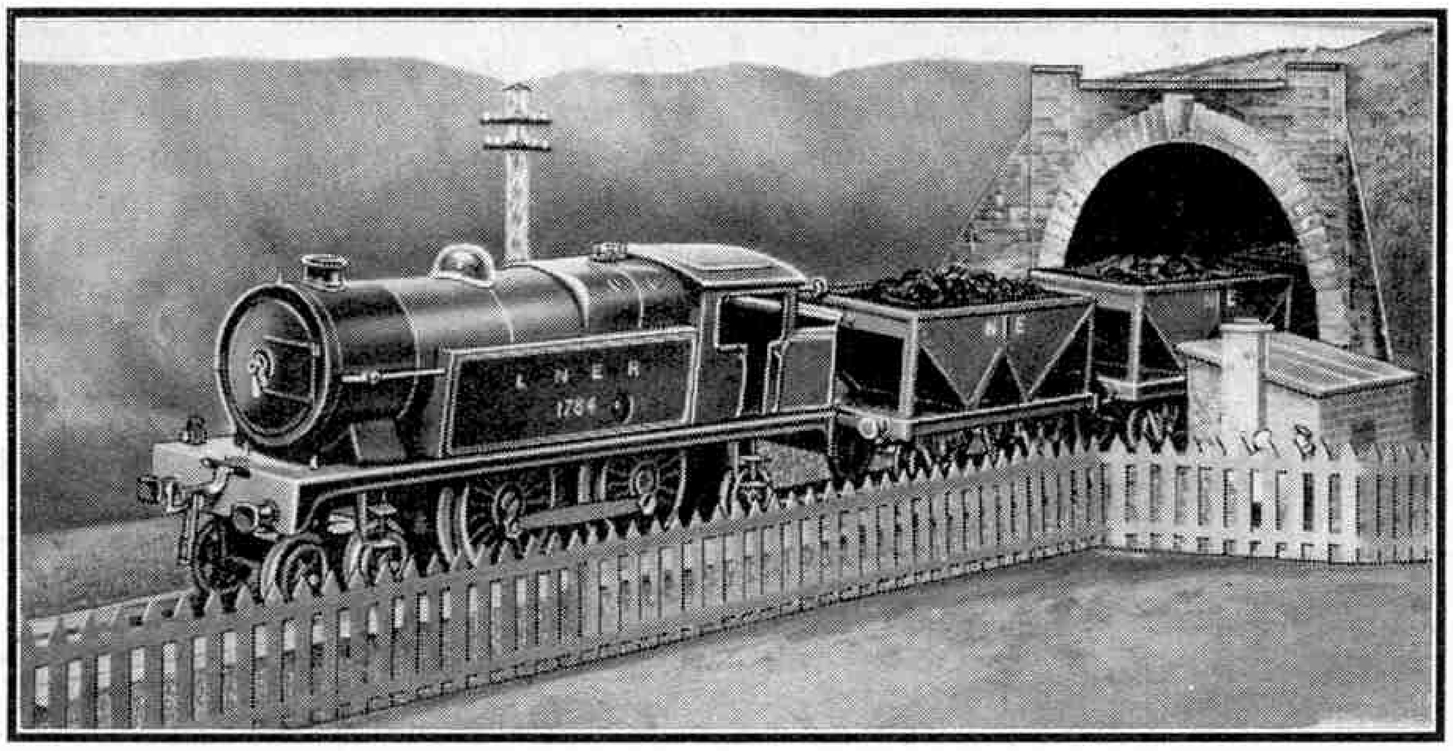


A fast goods train of Hornby No. 2 Luggage Vans passing a wayside station. These vehicles resemble the special high-capacity vans, or "Covfits," used in the North Eastern Area of the L.N.E.R.

The North Eastern Area finds extensive employment for large tank locomotives. There are several types of these, of pre-group origin, for passenger, goods and shunting work. They have been supplemented for local passenger services in certain areas by other engines built since the formation of the L.N.E.R. group. Miniature tank locomotives of large design, such as Hornby No. 2 Special Tank, can therefore be used with good effect, and may be employed equally well on local passenger or goods services, as is the case in actual practice.

In addition to its importance as a passenger line, the pre-group North Eastern carried the greatest annual tonnage of goods and mineral traffic of all the British railways. The important coal and iron producing areas are directly served, with the result that heavy traffic of these and associated types is normally dealt with. The transport of coal for shipment and bunkering is a particularly notable feature, and for many years special vehicles have been in use for this alone. On Hornby Railway, therefore, suitable provision must be made for the reproduction of heavy traffic of this kind. For the carriage of coal and minerals the Hornby Hopper Wagon is very attractive, especially in view of its rapid discharge qualities by means of its hopper doors. The use of coal handling plants of various kinds, for which Meccano Parts can be used very effectively, is a possible suggestion, and one that will add to the interest of a miniature "North Eastern" system.

The North Eastern also introduced what may be considered a British equivalent of the American "box car," or bogie covered goods van. These North Eastern products are characteristic in appearance and many of them are still running, but they appear to be confined to their own particular area, as is often the case with such special vehicles. They are used for fast goods traffic, and may also be attached to passenger trains as they are provided with automatic brakes. The name applied to these vehicles in the L.N.E.R. wagon code is "*Covfits*," from which term their covered character and the provision of automatic brake fittings may be deduced. The Hornby No. 2 Luggage Van can be used effectively to represent these vehicles, and typical fast goods trains can be made up with its aid. This Van can also be employed on passenger trains for luggage and parcels traffic.



A through L.N.E.R. mineral train emerging from a tunnel. The Hornby No. 2 Special Tank Locomotive is here used to represent the various large tank engine designs common on the former North Eastern system.

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

H.R.C. COMPETITION PAGE

Join the Hornby Railway Company and become eligible for the competitions announced on this page.

FAMOUS TRAINS CONTEST

The practice of giving names to railway locomotives and to the more important expresses has been developed systematically during recent years, and has met with general approval on the part of the travelling public. A named locomotive or train possesses an individuality that can never be acquired by one distinguished only by a number or a starting time. A journey from Euston to Glasgow, for instance, seems a far more interesting event when made by *"The Royal Scot"* hauled by *"The Princess Royal"* than the same journey made by the 10 o'clock from Euston hauled by engine No. 6200. We take a personal interest in a named train just as we do in a ship, and it is impossible to imagine a ship without a name.

The naming of locomotives is a very old practice and in the early days of railways, almost all the locomotives were given names. The naming of trains is not such an ancient custom, however, and in early instances the titles of trains so distinguished were more in the nature of nicknames, such as the *"Flying Dutchman"* on the G.W.R. Some names were connected with contemporary events, such as the *"Afghan"* of 1879 and the *"Zulu"* of 1880. Nor must we forget the *"Wild Irishman"* of the L.N.W.R. and the classic *"Flying Scotsman."* This last name was popularly applied for many years to the 10 a.m. from King's Cross, but was not a recognised title until comparatively recently.

Certain train names appeal strongly to the imagination. Others are more direct in their reference to the purpose and destination of the train. But whether it is *"The Lancastrian"* or *"Queen of Scots,"* the *"Cambrian Coast Express"* or the *"Bournemouth Limited,"* the named train seems more distinguished and is certainly better known than that familiar only by its departure time.

THE COMET
THE GRANITE CITY
THE THAMES FORTH EXPRESS
THE IRISH MAIL
CHANNEL ISLANDS BOAT EXPRESS
BRIGHTON BELLE
THE ROYAL HIGHLANDER
THE FYLDE COAST EXPRESS.
THE NORTH ATLANTIC EXPRESS
THE ANTWERP CONTINENTAL
TORBAY EXPRESS
THE DEVONIAN
THE THANET PULLMAN LIMITED
THE GOLDEN ARROW
ISLE OF MAN BOAT EXPRESS
THE WEST RIDING PULLMAN

In the panel in the centre of this page appear the names of 16 famous express trains. For our Contest this month we invite readers to write down in respect of each item—the terminal points between which the train runs; the operating company; the counties traversed; the distance travelled; the longest tunnel passed through; the rivers crossed; and the situation of any water troughs along the route. In order to make this Contest more interesting we have omitted some of the more famous expresses and have included a number of less famous trains. Some of these trains make journeys which are not so easy to follow as those made by the better-known expresses.

The Contest will be divided as usual into two Sections, Home and Overseas. To the senders of the four best entries in each Section, prizes of Hornby Train goods (or Meccano products if preferred) to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded. In addition a number of consolation prizes will be awarded.

Envelopes containing entries should be clearly marked *"H.R.C. May Famous Trains Contest"* in the top left-hand corner and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, on or before 31st May. Entries from Overseas competitors must be posted to arrive at Headquarters not later than 31st August. All entries must bear the competitor's name and full address, together with his H.R.C. membership number. A careful note should be made of the closing dates.

Railway Photographic Contest

The wide range of subjects submitted in the recent Photographic Contests shows that many interesting photographs would have been lost to us if the Contests had been confined to one particular railway item. For this reason we have decided to adopt for the remainder of the photographic season the policy of having no definite subject for these Contests. We therefore announce *"A Railway Photo Contest"* in which members may enter as many photographs as they wish, as long as each has a railway connection. The only restriction is that each exposure must have been made by the competitor, although the developing and printing may be the work of a professional. Although a competitor may submit as many prints as he desires, he cannot win more than one prize in one Contest. It is important that every print sent in should have on the back a description in a few words of the railway features shown, and the name, address and H.R.C. membership number of the sender.

The Contest will be divided, as usual, into two Sections, Home and Overseas; and prizes of Hornby Train material (or Meccano products if preferred) to the value of 21/–, 15/–, 10/6 and 5/– respectively will be awarded to the senders of the best photographs submitted in each Section. A number of consolation prizes also will be awarded.

Envelopes containing prints must be clearly marked *"H.R.C. May Railway Photo Contest,"* and posted to reach Headquarters at Meccano Ltd., Binns Road, Liverpool 13, not later than 31st May. Overseas closing date 31st August.

COMPETITION RESULTS

HOME

February "Nightmare Goods Contest."—First: J. C. Button (10335), Crewe, Cheshire. Second: K. Costain (5108), Bolton, Lancs. Third: W. B. Hudson (1733), Weymouth. Fourth: E. Beven (35158), Sheffield.

February "Word-Building Contest."—First: J. W. Aldrich (36899), Brighton. Second: G. Fairweather (42279), Bowerham, Lancaster. Third: A. Mossop (27655), Egremont, Cumb. Fourth: W. A. Brown (31709), Manchester, 10.

February "Photographic Contest."—First: V. L. Breeze (2134), Kingston, Lewes, Sussex. Second: B. R. Butler, Milverton, Som. Third: S. Garbutt (30122), Altrincham, Cheshire. Fourth: J. B. Wilson (2479), Wormit, Fife.

OVERSEAS

November "Rolling Stock Contest No. 3."—First: R. A. Wragg (7913), Rajputana, India. Second: I. Brough (9112), Australia. Third: A. A. Tibbitts (24271), S. Rhodesia. Fourth: F. L. Bingen (28995), Holland.

November "Questions Contest No. 6."—First: G. E. Schulz (15425), Australia. Second: D. Parker (38595), Canada. Third: R. Pascaud (29988), France. Fourth: E. C. Heath (29104), N.S.W., Australia.

Competition Corner

WHOSE SLOGANS ARE THESE?

This month's competition is the second of the short series of advertising competitions announced in the April "*M.M.*," and for this contest readers are set the task of identifying the products associated with the several well-known advertising slogans given in the centre panel on this page. Each of these slogans has appeared in the press or on the hoardings recently.

Prizes of Meccano products—this expression covers all goods listed in the current Meccano and Hornby Train catalogues—to the value of 21/–, 15/–, 10/6 and 5/– will be awarded to the four competitors, in order of merit, who succeed most nearly in providing a completely accurate list. In the event of a tie for any or all of the prizes, the judges will give preference to those entries displaying neat or novel presentation.

Readers who do not succeed in identifying all of the slogans should not be deterred from entering the competition. As was explained last month, all unsuccessful entrants to this series of competitions will be awarded consolation points for each entry according to the merit of their entries. At the close of the June contest—the last of the series—each competitor's total of consolation points will be ascertained and special prizes, value 5/– each, will be awarded to the 24 competitors whose totals are highest. The winning of a prize in any of the individual month's contests will automatically debar the competitor from securing one of these special consolation prizes. This point should be carefully noted.

Entries to this month's competition should be addressed "May Advertisement Contest, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 31st May.

A separate set of prizes, including several special consolation awards, will be reserved for Overseas competitors—those living outside Great Britain, Ireland and the Channel Islands. Overseas closing date 31st August.

1. Best Bakers Bake it
2. It lights where it's going—it's clean where it's gone
3. The amazing oxygen washer
4. Scotland's Best
5. Sip it! Drink it! Drain it!
6. If you wear wool, wear – – – – – –
7. The car it pays to pay a little more for
8. From the oatfield cometh strength
9. Masters the hair
10. Won't shrink woollens
11. Motoring at moderate cost
12. Better than a Mustard Plaster
13. He won't be happy till he gets it
14. Won't wash clothes
15. Britain's dependable car
16. The simplest home cleaning system
17. Always turn out well
18. Don't trudge it, – – – – – it
19. The Queen of cars
20. Keep that schoolgirl complexion
21. See the name on every piece
22. For sleep and energy
23. – – – – – will stop that cold
24. For chaps like us

May Photo Contest

As announced in the April "*M.M.*," until September next we shall offer prizes for the best and most interesting photographs submitted each month. The photographs may be of any subject, and may be made with any make of camera, plate, film or paper. The only conditions will be that each photograph must bear the reader's name, age and address, and a title on its back. The exposure must have been made by the competitor, but the developing and printing may be professionally done. All other points being equal, preference will be given to photographs that are solely the work of the competitor.

Each month's competition will be divided into two groups, Home for those living in Great Britain, Ireland and the Channel Islands, and Overseas for those living outside those areas. Each group will be divided into two sections, A for those aged 16 and over, B for those under 16; and prizes of Meccano Products or Photographic Materials, to be chosen by the winners, to the value of 21/– and 10/6 will be awarded in each section.

Entries sent this month must be addressed "May Photo Contest, Meccano Magazine, Binns Road, Liverpool 13," and must arrive not later than 31st May. May will be ended before this issue reaches many of our Overseas readers, but it will be in order for them to address as for the May Competition all entries that can reach us before the Overseas closing date for that Contest, 31st August.

Competition Closing Dates

HOME

May Advertisement Contest	31st May
May Photo Contest	31st May

OVERSEAS

Doublets Contest	31st May
February Drawing Contest	31st May
Dog Contest	29th June
March Drawing Contest	29th June
April Advertisement Contest	31st July
April Photo Contest	31st July
May Advertisement Contest	31st August
May Photo Contest	31st August

Watch the Closing Dates:

Competitors, both Home and Overseas, are particularly requested to make a careful note of the closing dates of the competitions.

In sending entries to competitions that are divided into age groups, competitors should take particular care to mark their ages clearly on the back of the entry. It is not sufficient merely to indicate the age group, as age allowances are given to ensure equality of opportunity for the younger competitors.

Entries, other than prize-winning efforts, for photographic, drawing and similar competitions, will be returned to the competitors concerned if a stamped addressed wrapper is sent with the entry, and its return requested. Prize-winning entries are retained by the Editor.

COMPETITION RESULTS

HOME

March Drawing Contest.—First Prizes: Section A, A. MARSH (Coventry); Section B, P. M. Ross (Doncaster); Second Prizes: Section A, N. S. GRIFFITHS (Gidea Park); Section B, J. K. MACKEN (Bromley). Consolation Prizes: R. CARTER (Tadworth); H. W. CLARY (Southall); K. COSTAIN (Bolton); G. COTTON (Niton, I.O.W.); D. GAY (Christchurch); D. HALL (London, N.12); A. OAKLEY (Brightlingsea); B. RANKIN (Abergele); C. WARD (Worthing); G. WEAL (Romford); D. WELLOURNE (Sutton-in-Ashfield).

Dog Contest.—1. D. F. ASHTON (London, N.22); 2. E. A. LIFE (Watford); 3. S. W. BUSH (London, E.12); J. R. COTTERELL (Tadworth). Consolation Prizes: C. BRETT (Great Coates); A. K. BROMLEY (Manchester); D. W. CONNOR (Barking); A. GRAVES (London, E.11); J. MILLER (London, E.4); J. POLLOCK (Ballymoney); E. TAYLOR (Watford).

OVERSEAS

December Drawing Contest.—First Prizes: Section A, W. FIGGINS (Timaru, N.Z.); Section B, NILS SODERBERG (Falun, Sweden). Second Prizes: Section A, D. E. YOCKNEY (Auckland, N.Z.); Section B, M. CONLY (Dunedin, N.Z.). Consolation Prize: P. SWAN (Rangoon, Burma).

Advertisement Jig-Saw Contest.—1. R. S. MANSFIELD (Sydney, N.S.W.); 2. R. PASCAUD (Chaumont, France); 3. R. Q. WILDING-WHITE (Buenos Aires); 4. D. J. WHITE (Christchurch, N.Z.). Consolation Prizes: C. A. ASTROM (Morko, Sweden); O. EHM (Brisbane); A. COX (Hawera, N.Z.); E. B. COX (Hawera, N.Z.); C. FELDMAN (Rondebosch, C.P.); L. S. HANSEN (Faaborg, Denmark); R. G. HUTTON (Canterbury, N.Z.); R. F. JAMES (Pietermaritzburgh, Natal); K. KNOX (Melbourne); D. MAYER (Brooklyn, Capetown); A. E. PAGE (Kimberley); D. E. YOCKNEY (Auckland, N.Z.).

Feature Voting Contest.—1. J. A. COATES (Greenfield Park, P.Q.); 2. J. JASPER (Manly, Queensland); 3. J. BROWN (Cambridge, N.Z.); 4. P. M. WULFSOHN (Johannesburg).

SPECIAL

SILVER JUBILEE

Number of the World's Finest Magazine for Stamp Collectors.

Gibbons Stamp Monthly

Now on Sale

3d.

FIVE SPECIAL FEATURES:

EMPIRE SILVER JUBILEE STAMPS.
By Frederick Wall.

STAMPS OF THE REIGN.
By Stanley Phillips.

THE KING AS A STAMP COLLECTOR.
By Fred J. Melville.

HOW THE NEW BRITISH STAMPS ARE PRINTED. An officially authorised description.
By Fred J. Melville.

Free ILLUSTRATION PLATE, "EMPIRE STAMPS, 1910-1935."

And all the usual features.

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ROYAL JUBILEE PACKET FREE!!

This memorable packet is issued as a record of the 25 years' reign of H.M. King George V, and includes stamps issued 25 years ago and some of the newest issues, including CYPRUS (Jubilee), the scarce black stamp, The King and Queen together on a stamp, the pictorial (sheep) Macarthur commemorative, 15c Tanganyika, Large Trinidad and Tobago, The King in Admiral's uniform, a fine stamp depicting H.R.H. The Prince of Wales, early K.G. Canadian and Australian issues, also an interesting British Guiana. Other countries include—A beautiful bi-coloured PERSIA (Shah), an olive unused Turkey (G.P.O. at Constantinople), a large orange Airmail, a beautiful Cracow, and an old Queensland. 60 different stamps. Finally, to the first 500 applicants we will include a useful DUPLICATE ALBUM and an obsolete Jamaica pictorial stamp. All absolutely free. Just send 2d. requesting approvals. You always get the best gifts and stamps from

LISBURN & TOWNSEND LTD. (DEPT. M.M.), LIVERPOOL. **(Collections purchased.)**

Free! 4 MINT JUBILEE COLONIALS

TO ALL STAMP COLLECTORS SENDING 2½d. POSTAGE

LIMITED SUPPLY

G. P. KEEF, WILLINGDON, EASTBOURNE

No. 3 THE KING'S JUBILEE No. 3

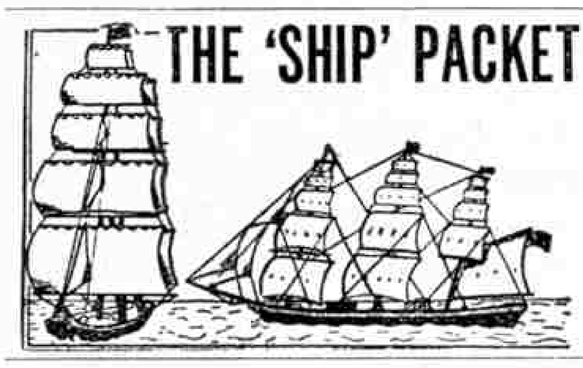
The third and biggest packet given to celebrate the Jubilee of His Majesty the King by the University Stamp Co. will be given **FREE THIS MONTH.** It contains the **SILVER JUBILEE STAMPS FOR GRENADA, AUSTRALIA, McArthur Centenary, TRANS-JORDAN,** latest issue, **SILVER JUBILEE STAMP FOR TURKS ISLAND,** Iraq, pictorial, Bermuda, HUNGARIAN AIRMAIL, ROUMANIAN AIRMAIL, Belgium mourning stamp, and many other fine stamps.

FREE FREE AND POST FREE to all applicants for our splendid approvals. **FREE**
UNIVERSITY STAMP CO., 250, COWLEY ROAD, OXFORD.

Turks & Caicos Islands Jubilee Stamp FREE!

From the 10th of this month onwards, to **celebrate the King's Jubilee,** we are **presenting absolutely free** to all applicants for our **bargain** approvals this wonderful packet containing a **large mint TURKS & CAICOS IS. Jubilee Commemorative portraying Windsor Castle** (illustrated on opposite page), also a **large PERSIAN AIR MAIL, mint Pictorial;** Scarce **BAHAMAS K.E.; Sudan** pictorial; **Angola** mint; set of 7 **India,** new issues, etc.; **Gaboon,** mint pictorial; **Cape Verde,** mint; **Obangui,** pictorial; **French Peace;** a Hindenburg **Birthday Commem.;** Nigeria; **Gold Coast;** and a superb set of 6 African Pictorials, etc. **Write at once** sending 1½d. postage only.

THE PUKKA STAMP CO., 27, NORMANDY AVENUE, BARNET.



THE 'SHIP' PACKET

This marvellous packet is offered under cost as an advertisement. **48** different stamps **each with a ship on it.** A regular armada. **GABOON,** a rare **FOOCHOW** (War Canoe), wonderful flotilla of caravels from **DENMARK** (complete set), **ITALY** (Naval Academy), **NEW CALEDONIA, IVORY COAST, COSTA RICA,** a fleet of **10 CHINESE** junks usually sold at 10d., **TRINIDAD & TOBAGO, BERMUDA, SOUTH WEST AFRICA, NEWFOUNDLAND, U.S.A., B. GUIANA,** set of **S. AFRICA, GREECE, CUBA, POLAND, INDO-CHINA,** etc. Price **4½d.,** postage 1½d. (abroad 3d. extra). Purchasers of this packet asking for approvals receive **FREE** set of **4 SPAIN** (Columbus, each with his ship on it). Senders of addresses of stamp collectors receive **FREE** set of **4 ICHANG.**

100 BRITISH COLONIALS 1/–, 20 AIRPORT 6d., 6 TRIANGULARS 6d. VOLUMES OF B.O.P. CHEAP.

H. C. WATKINS (M. Dept.), Granville Road, BARNET

FREE! **100 DIFFERENT BRITISH COLONIALS** **FREE!**

This wonderful offer of the World's most popular stamps, from most of the colonies of our Empire, includes pictorials, commemoratives, high values, bird, ship and animal stamps, out-of-the-way stamps. Long sets, many new issues, etc. ABSOLUTELY FREE TO GENUINE APPROVAL APPLICANTS WHO SEND 2d. FOR POSTAGE. **J. BURTON, 82, Dinas Lane, Roby, Nr. Liverpool.**

SETS (POSTAGE EXTRA)

5 Borneo ...	... 7d.	5 Bolivia ...	... 3d.
10 ,, ...	... 1/3	10 Chili ...	... 4d.
5 Labuan ...	... 8d.	5 Colombia	... 2d.
10 ,, ...	... 1/4	5 Congo ...	... 4d.
5 Sierra Leone	... 4d.	10 ,, ...	... 9d.
10 ,, ,,	... 9d.	5 Costa Rica	... 3d.
3 ,, ,, com.	6d.	10 ,, ,,	... 6d.
5 Antioquia	... 2d.	10 Cuba ...	... 4d.
10 Guatemala	... 4d.	10 Dantzig ...	... 2d.
5 Gold Coast	... 3d.	10 Dominican Rep.	4d.
15 Persia ...	... 6d.	10 Honduras	... 4d.
5 Syria ...	... 2d.	10 Lebanon	... 4d.
10 ,, ...	... 4d.	10 Lithuania	... 4d.
4 Abyssinia	... 3d.	10 Luxemburg	... 4d.

J. RUSSELL,

23, Shanklin Drive, Westcliff-on-Sea.

NYASSA TRIANGLES! EGYPT AIR MAILS!! PICTORIALS!!! 130 STAMPS 6d.

Including set of unused **Nyassa Triangles.** Set of **Egypt 1933 Air Mails** showing Aeroplane flying over Pyramids. Eight interesting **African British Colonials** catalogued at 5/1. Seven **Canada** including Ottawa Conference issue. Large **Belgium Piccard Balloon Commemorative** stamp. Complete unused set of **5 Russia, 1919 Northern Army issue.** Other stamps include used **Roumania 1931 Air Mails** showing Monoplane, unused Air Mails, surcharged issues and pictorials. All different. **Price 6d.** (Postage 1½d. extra.) Money and postage will be returned if not satisfactory. We have numerous other offers at low prices. Hundreds of unsolicited testimonials have been received.

W. BENNETT

53, MARLBOROUGH ROAD, LONDON, E.8

Boys! all these for 6½d.

LOOK. Pair Tweezers, Watermark Detector, Pocket Wallet (strip pockets), Perforation Gauge, Approval Book (120 spaces), 125 stamp hinges, 5 transparent envelopes. Price lists and a free gift set Pictorial Stamps. All for 6½d. and British too. Tell your dealer "XLCR," or write THOMAS CLIFFE, COLWYN BAY

GIANT JUBILEE PACKET FREE!!

Commemorating the Jubilee, I offer **Free, 510 Unsorted Foreign Stamps,** many scarce from **Newfoundland, Kenya and Uganda, Siam, Prussia, Finland, Chinese, Denmark,** etc., etc. Just send 2d. stamp and request my **Famous Extra-Large-Discount Approval Sheets.** (Abroad 6d. P.O.)

E. EASTICK, 22, Bankside Road, Bournemouth.

ALL BRITISH COLONIAL APPROVALS

A fine British Colonial pictorial set of **GAMBIA** or **DOMINICA FREE** to Collectors sending for **ALL BRITISH COLONIAL APPROVALS.** (Both sets to those enclosing 1½d. stamp.) **BRITISH COLONIALS ONLY,** many scarce stamps at bargain prices, satisfaction guaranteed. (Abroad deposit plus 6d. postage, P.O. only.)

C. H. SHAW (Dept. M5), 95, CHRISTCHURCH AVENUE, KENTON, HARROW.

Post in unsealed envelope. ½d. POST ONLY.
Send me free each month 2 New Issues and Approvals.

Name .....

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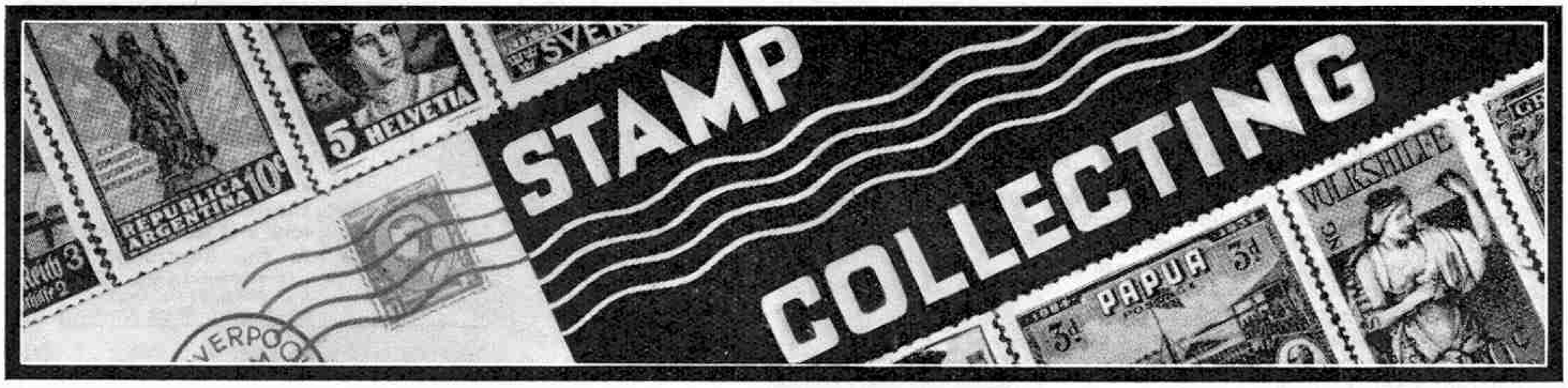
You may use plain paper if preferred but you must then put 1½d. stamp on your envelope.

NEW ISSUES FREE EACH MONTH

KEEP UP-TO-DATE THIS LATEST WAY!

Let the postman bring you free every month 2 of the very latest stamps issued! **REMEMBER**—The New Issues of to-day are the **RARITIES** of to-morrow, but up till now it has been impossible for collectors to keep right up-to-date without joining expensive New Issue Services. All this is changed, and 2 of the World's most nteresting New Issues are **FREE TO YOU EACH MONTH** just for the asking. **SEND NO MONEY**—Just fill in the application form (or plain paper) requesting gifts and approvals.

VICTOR BANCROFT, MATLOCK, ENGLAND



THE KING'S COLLECTION

By courtesy of the Colonial Office we are able to give this advance reproduction of the design of the Royal Jubilee stamp to be issued by the Crown Colonies this month.

STAMP collecting has often been described as the King of Hobbies and the Hobby of Kings; but while it is true to say that every ruler, in his official capacity at least, collects stamps, of only a few royal personages may it be truly said that they are philatelists. Of these, King George is unquestionably the most famous, although he is pressed closely for pride of place by King Fuad of Egypt. For some considerable time His Majesty, when Duke of York, held the office of President of the Royal Philatelic Society, and at the opening meeting of each session the members still have the privilege of inspecting a section of the royal collection. The King's name heads the Roll of Distinguished Philatelists, which includes the names of the leading philatelists of many nations.

King George has been collecting stamps since his boyhood days when, as a midshipman of the British Navy, he served in almost every foreign station, and had unrivalled opportunities for indulging his interest in the hobby. To-day his collection is housed in hundreds of volumes and requires the constant care of a Curator, which position at the moment is filled by the eminent philatelist Mr. E. D. Bacon, C.V.O. Although the calls upon His Majesty's time are so extensive, he still finds it possible to devote one afternoon each week to his stamps, when in residence at Buckingham Palace.

It is probable that the King's first interest in the hobby was inspired by his uncle, the Duke of Saxe-Coburg-Gotha, who, as Duke of Edinburgh, had long been a collector when he first publicly associated himself with the hobby by opening the London Philatelic Exhibition in 1890.

The King, although a general collector, has naturally concentrated very largely on stamps of the British Empire, and his British West Indian stamps probably comprise the finest B.W.I. collection existing to-day. The gems of the B.W.I. volumes are the 2d. blue Mauritius "Post Office" issue and its companion, the 1d. red.

The 2d. blue is actually the best stamp in the royal collection, and the finest known unused specimen of this rare stamp. Its history is a remarkably romantic one, for it was originally housed in a collection formed when a schoolboy by Mr. James Bonar, an official of the Civil Service Commission. For 40 years it lay hidden, until 1904, when its owner, searching through some old papers, came across his ancient pocket album and showed it to a lady friend whom he knew to be interested in stamps. She immediately recognised the rare specimen and persuaded Mr. Bonar to submit it for expert opinion. Later it was put up for sale at auction and was purchased by the King for £1,450! Mr. Nevile Stocken, in his book "*Stamps of Great Price*," comments: "In view of the extraordinary rise in prices since then, if this copy, with its halo of romance and royalty round it, ever found its way into the open market, I should expect it to realise something like £5,000."

The King's collection of Mauritius is almost complete from beginning to date, and also includes a unique block of five of the early 2d. "Post Paid" stamps, in unused and exceptionally fine condition, including the very rare *Penoe* for *Pence* error *se tenant* with its four neighbours on the sheet. It is very difficult to assess the value of this piece, but certainly it would realise four figures!

This splendid portrait of His Majesty the King, and those of the Queen and the Prince of Wales at the bottom of the page, are taken from Newfoundland's 1932 issue.

His Majesty is shown here in the uniform of an Admiral of the Fleet. The stamp is from New Zealand's 1926 issue.

This design shows the Royal Jubilee stamp to be issued by Southern Rhodesia. The advance reproduction is by courtesy of the High Commissioner for Southern Rhodesia.

As is to be expected, the King's collection of the stamps of Great Britain is outstandingly fine, and includes much interesting philatelic material, apart from stamps themselves. For example, there is the original sketch of the design for the famous Mulready envelopes and letter sheets prepared in 1840. There is also a pair of sketches roughly done by Sir Rowland Hill to show the appearance of the proposed penny black and twopenny blue stamps.

A curiosity is a sheet of penny stamps as printed for booklets in four panes of 60 stamps arranged in vertical rows of 10 each. Each alternate three rows are inverted, thus producing a certain number of *tete-beche* pairs. Outside Somerset House and the printers, this sheet is probably unique!

Among other unique pieces is an unused King Edward 6d. I.R. official. No other unused copy of this stamp exists, and only three are known to have been postally used. The unused copy was recently priced up to 185,000 francs in the Yvert catalogue—the "Gibbons" of France.

The collection includes two unused specimens and the only postally used copy of the Tyrian Plum coloured 2d. King Edward stamp. This stamp was ready for issue at the time of King Edward's death, and it was decided then to withhold it. The King's used specimen of this stamp is on a cover addressed to him as Prince of Wales at Marlborough House. Another notable item is the only known used copy of the 1d. scarlet Army Official error (with *Army* omitted). This error was probably accidentally caused by some foreign body intervening between the type and the paper during printing.

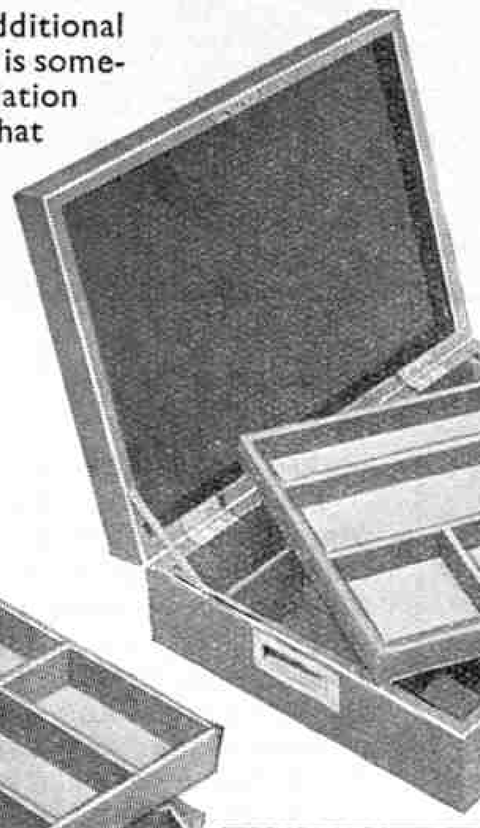
His Majesty's Australian collection includes many interesting pieces, most prominent among which are the "inverted frame" and "top of Australia cut off" varieties of the 4d. blue of 1854. Of the latter variety only one other copy is known to exist, and of the former there are only nine other known copies.

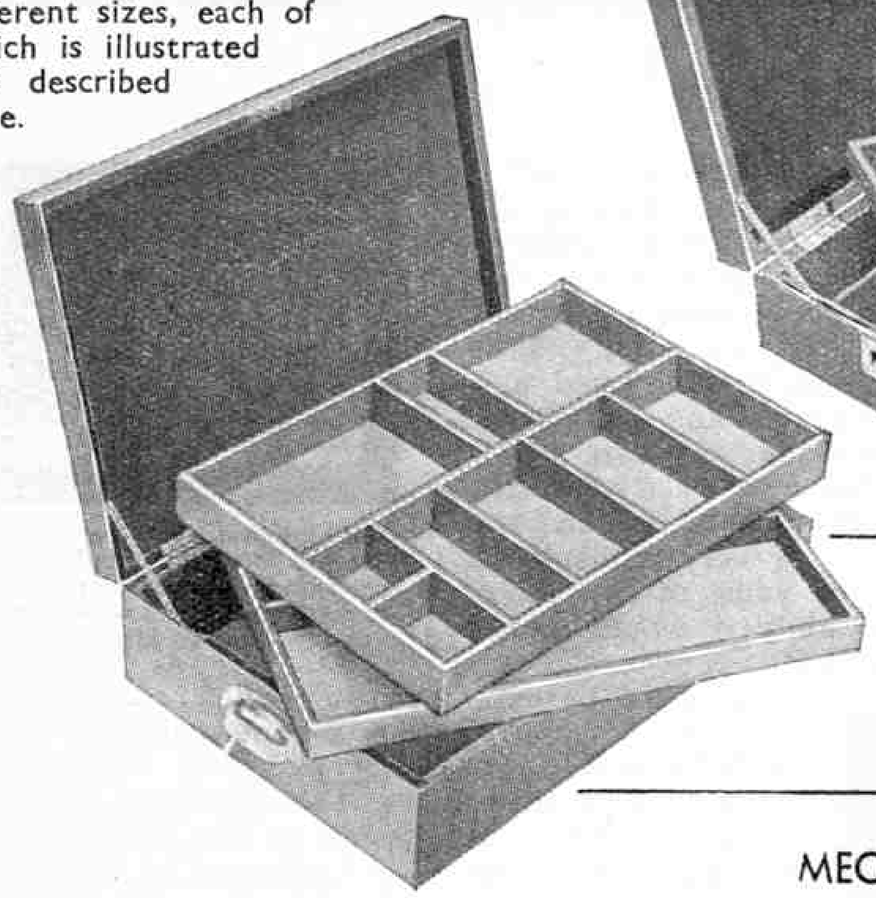
In a short article such as this it is impossible to do justice to so extensive a collection, but sufficient has been shown to enable our stamp collecting readers to feel that they have justification for entering into this year's Royal Jubilee celebrations as fellow stamp collectors as well as loyal citizens.

His Majesty's practical interest in stamp collecting has done more in a few years to raise the status of the hobby than anything that could have been achieved by collectors of less exalted rank.

MECCANO
STORAGE BOXES

Almost every Meccano boy purchases additional Meccano parts from time to time, but there is sometimes difficulty in finding suitable accommodation for them. We supply strongly made boxes that have been specially designed for the purpose, enabling extra parts to be stored neatly and methodically so that they are always easily accessible. There are three different sizes, each of which is illustrated and described here.





No. 1 STORAGE BOX

This Storage Box is attractively finished in colour, and is fitted with partitions. Two special snap fasteners are used to secure the lid instead of the lock and key shown in the illustration.

Dimensions: Length 15½ ins. Width 8¾ ins. Depth 2¾ ins. Price **6/—**

No. 2 STORAGE BOX

No. 2 Storage Box is tastefully finished in red. The partitioned tray with which it is fitted enables a large quantity of parts to be accommodated.

Dimensions: Length 14½ ins. Width 11 ins. Depth 3¾ ins. Price **10/—**

NOTE: With slight modifications this box can be made to accommodate the contents of the No. 3 Meccano Kemex Outfit. We are prepared to undertake the necessary alterations at an extra charge of 2/6.

No. 3 STORAGE BOX

No. 3 Storage Box is a perfect receptacle for Meccano parts, strongly made and attractively finished in red. It is fitted with two brass handles, and the lid is secured by means of two snap fasteners. Two partitioned trays are included, as shown in the illustration.

Dimensions: Length 20 ins. Width 14 ins. Depth 5½ ins. Price **20/—**

MANUFACTURED BY

MECCANO LIMITED, BINNS ROAD, LIVERPOOL 13

"1,000 PACKET" A Wonderful Offer for 5D. Postage 2½d. ex. Abroad 6d. ex.

The "1,000 Packet" contains 500 excellently assorted Stamps; a **Complete Sheet of 100 Unused** (very useful for exchange purposes); a neat 12-page booklet for holding duplicates; 25 British Colonials, usually sold at ½d. to 1d. each, including new and obsolete issues; 375 Magic "Strip" Mounts, which mount stamps three times as quickly as the old-fashioned single ones; my price list of stamp bargains. In addition, free sets will be sent to those who send names of stamp-collecting friends. *Ask for my famous Approvals.* "B.O.P." and "Captain" monthly parts cheap; also 24 bound volumes of "Chums." Write for particulars.

H. C. WATKINS, "M" DEPT., GRANVILLE ROAD, BARNET

THE FIRST STAMP Ever Issued

(British 1840 Penny Black) for P.O. 1/9! It is guaranteed genuine in every respect. Its companion stamp (1840, 2d. blue) for a further 5/– (cat. 20/–)! Other "Classics" which every Collector should have are the **Cape of Good Hope Triangulars;** we offer 1d. rose (cat. 40/–) for 12/6; 4d. blue (cat. 15/–) for 5/–; and 6d. lilac (cat. 60/–) at 15/–. Superb approvals of any country against approval English References or a deposit. **Full Lists Free.**

NORRIS & CO. (Dept. M), NORWOOD, LONDON, S.E.19

ONE THOUSAND STAMPS on APPROVAL

from which any 100 may be selected for 3/–. (Some of these stamps are catalogued at 1/– each or more.) I do not sell less than 100.

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H. L. Gomm, 41, Upper Cranbrook Rd., Redland, Bristol, 6

Stamp Gossip

and Notes on New Issues

The Trinidad Pictorials

This month we are able to reproduce specimens from Trinidad's new pictorial issue, and we have chosen the 1c. and 6c. values for this purpose. No doubt many of our readers were puzzled by the reference to the first Boca in our advance note in the February *"M.M.,"* and wondered what the first Boca could be. Actually there are four Bocas, these being the four channels joining the Caribbean Sea to the Gulf of Paria, the great inlet on Trinidad's western shore. The first Boca is the most easterly of these channels, and runs between the mainland and the Island of Monos.

The 6c. stamp represents the scene at the discovery of the famous Trinidad pitch lake by Sir Walter Raleigh in 1595. The lake occupies an area of approximately 127 acres, half a mile inland from the Gulf of Paria and nearly 60 miles south of Port-of-Spain. Raleigh used the pitch for caulking the seams of his vessels, and it was not until 1851 that the importance of the material for road-making was foreseen.

It is interesting to know that the design of this stamp is based upon a picture used by the Limmer & Trinidad Lake Asphalte Company in the promotion of Trinidad Lake asphalte as an Empire product. A Trinidad Government official was visiting Mr. Vandeburgh, the engineer at the Lake, and noticed the picture in his office. He was so impressed by it that he recommended it to the Government for the new stamp issue. Later the Trinidad Government got into cable touch with the English headquarters of the Company and secured permission to use the design, which, we are sure all our readers will agree, makes a very handsome stamp.

* * *

Those of our readers who are accustomed to use benzine when inspecting watermarks should exercise great care when subjecting the new British issues to this treatment. It would seem that the colours are not "fast" in benzine. No great harm results if the stamps are simply dipped in the spirit and allowed to dry naturally. The trouble develops if the benzine is blotted off, or the surface of the stamp rubbed while still damp.

The Jubilee Stamps

By courtesy of the Colonial Office we are able to give an advance reproduction of the design for the Royal Jubilee stamps to be issued in the British Colonies and Dependencies. With the simple inclusion of the name of the Colony on its individual stamps, this design is to be used in each of the Colonies, a list of which was given in the *"M.M."* last month.

The stamps will be on sale on 6th May, and will remain in use until 31st December of this year. Stocks remaining on hand then will be withdrawn and destroyed. The sale of the corresponding values in the permanent issues of the Colonies will be discontinued during the period of issue of the Jubilee stamps.

Southern Rhodesia is to issue a distinctive series, and by courtesy of the High Commissioner for Southern Rhodesia we are enabled to reproduce the design on the preceding page. This shows, in addition to a splendid portrait of His Majesty, a view of the famous Victoria Falls, with a group of typical Rhodesian animals, including the Giraffe, Elephant, Lion and Sable Antelope. There will be four values, 1d., 2d., 3d. and 6d., and the stamps will be on sale for a limited period from 10th May.

* * *

Soviet Russia's commemorative stamp designs have always been attractive, but we fear the popularity of these series is definitely on the wane. Even the most unobservant could not fail to observe the lack of reasonable excuse for many of the recent issues. It has been apparent that revenue from sales to stamp collectors has been their principal aim.

Striking proof of the "money making" nature of these needless commemoratives is available in the form of a letter received by our advertisers, Stanley Gibbons Ltd., from the Soviet Philatelic Association, the official sales bureau for new issues. Briefly, the letter reports that the enormous volume of orders for stamps of certain issues has made it necessary to increase prices by 20 per cent. for unused, and by 50 per cent. for used specimens! Imagine going into a local post office and being asked to pay 1½d. for a penny stamp "because supplies are a little short!" Our readers should ignore the Soviet issues.

We thank Stanley Gibbons Ltd. for their courtesy in loaning the stamps from which the illustrations for our stamp pages have been made.

Brussels Exhibition Commemoratives

In connection with the great International Exhibition now being held at Brussels, a description of which appears in the special article on page 272, Belgium has issued a special series of commemorative stamps from which we illustrate the 1Fr. and 1Fr.75 values. The 1Fr. gives a splendid impression of the Pavilion of the Town of Brussels, while the 1Fr.75 gives an exterior view of the Grand Palais. The latter building is notable for the tremendous area of uninterrupted floor space achieved by the use of gigantic roof arches, each of which has a span of 86 metres (280 ft.) and a height of 31 metres (100 ft.).

* * *

Sporting readers will be interested to see our illustration of the Colombian commemorative issue celebrating the third National Olympiad recently held at Barranquilla. The series comprised 16 stamps, with designs as follows: 2c., Footballers; 4c., Discus Thrower; 5c., Allegory of 1935 Olympiad; 7c., Marathon Runners; 8c., Tennis Player; 10c., Hurdler; 12c., Pier; 15c., Athlete; 18c., Baseball Player; 20c., Seashore; 24c., Swimmer; 50c., An aerial view of Barranquilla; 1p., G.P.O., Barranquilla; 2p., the Flag of the Race Monument; 5p., National Coat of Arms; 10p., a Condor.

A Persian History

A "national history in a nutshell" would be an apt description of Persia's new pictorial stamp issue, for in the restricted space of nine stamp designs there is given a very clear cut story of progress from ancient days to modern times.

The designs and values are as follows: 5 dinars, Allegory of Justice; 10d., Ruins of Persepolis; 15d., Allegory of Education; 30d., Aerodrome at Teheran; 45d., Sarhtessar Sanatorium; 75d., a cement works near Teheran; 90d., the Persian naval cruiser *"Palang"*; 1 rial, the railway bridge over the River Karoun; 1.50r., New Post Office and Customs House, Teheran.

An interesting feature of the stamps is the retention of the inscription *"Postes Persanes,"* although the name of the country has been officially changed to Iran.

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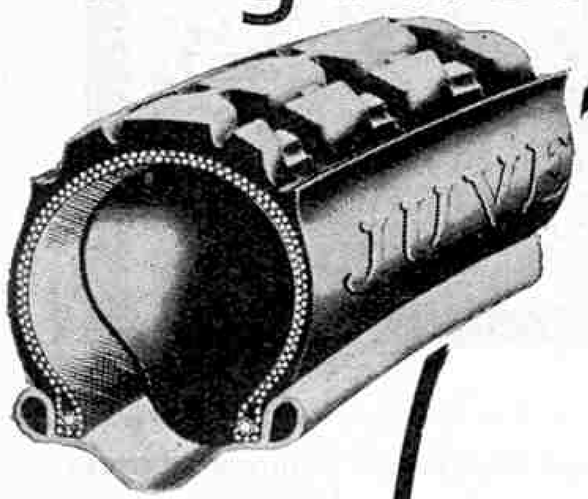
are supreme!



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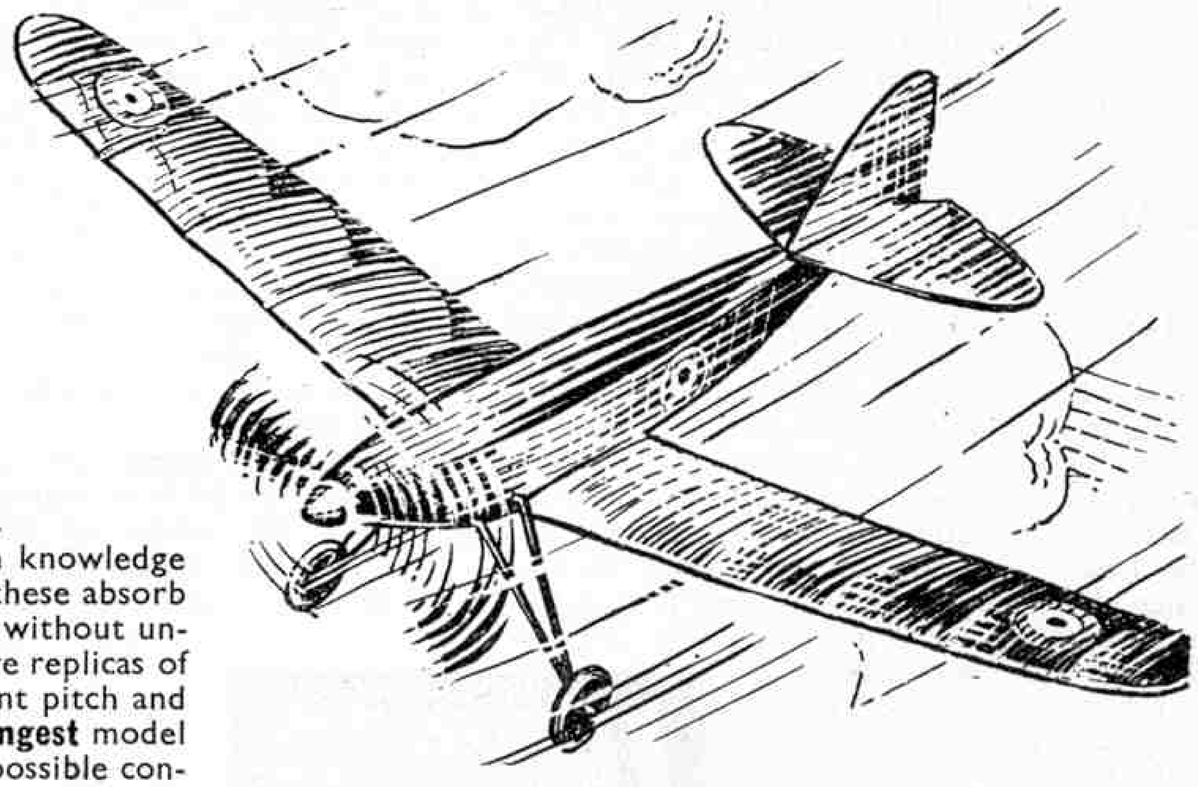
FLYING MODEL AIRCRAFT



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LOVAINE CRESCENT MODEL WORKS
NEWCASTLE-UPON-TYNE

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A GOOD SUBSTITUTE

First Tough: "I understand that you provided your brother with the means of opening a jeweller's shop. I didn't know you had money."

Second Tough: "I haven't—but I have a crowbar."

* * * *

"If I posted a letter addressed to the biggest fool in England I wonder what would the Post Office do with it?"

"Probably return it to the sender."

* * * *

Fishmonger: "Haven't you finished scaling that fish yet?"

New Assistant: "Not yet, sir. It's a very big one."

Fishmonger: "Well hurry up. You've had time enough to scale a mountain!"

* * * *

Diner: "Waiter, you've given me a wet plate."

Waiter: "That's your soup, sir."

* * * *

Motorist (who has bought a "dud" second-hand car): "I thought you said this car had been completely overhauled?"

Second-hand Dealer: "That's quite right, sir. It's been overhauled by every other car on the road."

* * * *

The foreman found one of his navvies resting on his spade. "I thought you told me you never got tired," he thundered.

"Quite right, guv'nor," was the reply. "I always stop and rest before I get tired."

* * * *

Father to Son: "Why don't you get out and find a job? When I was your age I was working for three dollars a week in a store, and at the end of five years I owned the store."

Son: "You can't do that nowadays. They have cash registers."

* * * *

Father: "Well, Betty, what did you think of going to church?"

Betty: "All right except for one thing, which was very unfair."

Father: "What was that?"

Betty: "Well, one man did all the work and then another one came round and got all the money."

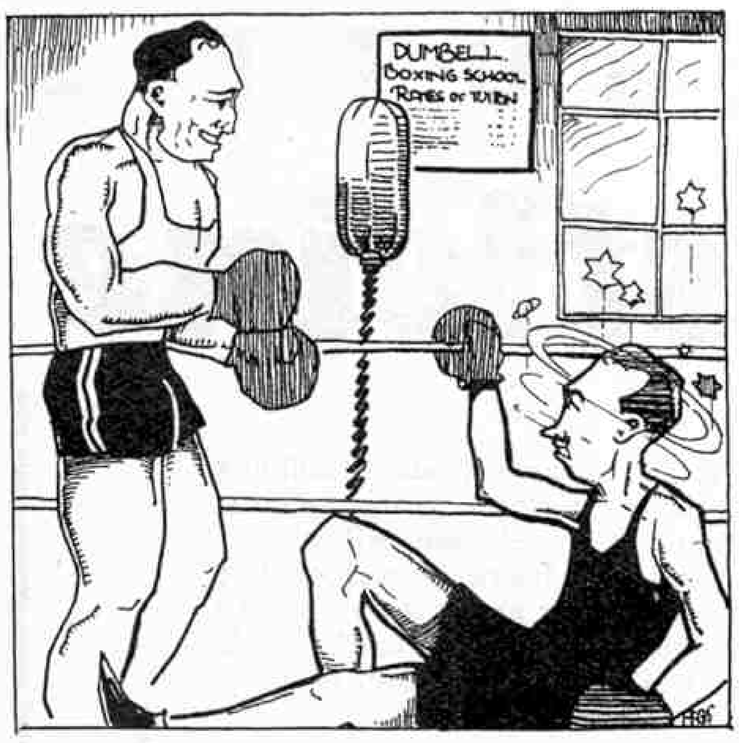
* * * *

Housewife: "But my good man, your story has a very hollow ring."

Tramp: "That comes from speaking on an empty stomach, lady."

* * * *

PLENTY OF VARIETY



Pupil (picking himself up wearily): "Do you think it was really necessary to knock me down in that brutal fashion?"

Boxing Instructor: "No, not really. There are at least 24 other ways to choose from."

HOMING!

High: "How did your article on perpetual motion turn out?"

Jinks: "It's a complete success. Every time I send it out it comes back!"

* * * *

"People are not nearly so formal as they used to be."

"No," said Mr. Chuggins. "Nearly every time I go out in the car policemen to whom I have never been introduced don't hesitate to speak to me."

* * * *

THE SAME THING

A noble lord had kindly thrown open to visitors the picture gallery at his mansion, and the head gardener had been put in charge.

A visitor stopped admiringly in front of a portrait. "Is that an Old Master?" he asked.

"No, sir," replied the temporary attendant, "An old missus."

* * * *

Teacher: "Name four wild animals found in Africa."

Pupil: "Two lions and two tigers."

* * * *

Brown: "I see you've named your house 'Simla.' I suppose that is because you lived in India for some time?"

White: "Oh, no; we just call it that because it is "simla" to all the others in the road."

* * * *

Mother: "Well, darling, what did you learn on your first day at school?"

Small Son: "Not much. I have got to go again to-morrow."

* * * *

Teacher: "What is the plural of hippopotamus?"

Boy: "The plural of hippopotamus is h-i-p-p-o—oh, well, who'd want more than one, anyway?"

* * * *

"Can't see why I should buy your book," said the farmer to the persistent canvasser.

"Why, it will show you how to be a better farmer."

"Listen, son," said the elderly man, impressively, "I'm not half as good a farmer now as I know how to be."

* * * *

Applicant for job: "Shall I have a chance to rise at this job?"

Butcher: "You certainly will. I want you here every morning by six o'clock."

* * * *

Bones: "How many yards do it take to make a shirt like dat one, Rufus?"

Rufus (proudly sporting a new shirt): "Well Bones, ah got two shirts like this out'n one yard last night."

* * * *

Garage Proprietor: "That will be seven and sixpence."

Owner of Car: "Seven and sixpence? You had better keep the car."

Proprietor: "Alright, then that will leave a balance of five shillings you owe me."

TIMES CHANGE

"I suppose," said the colonel to the subaltern, "it's the same old story, the fool of the family, send him into the Army."

"Oh, no, Sir, that's all altered since your day."

* * * *

Land-lubber: "Well, how has life in the Navy turned out?"

Sailor: "Turned out? Well there's too much turning. At night you turn in, and just as you are about to turn over somebody turns up and shouts 'Turn out!' "

* * * *

Sandy was learning to play the bagpipes. One night while he was strutting about the room, skirling for all he was worth, his wife attempted a mild protest. "That's an awfu' noise ye're makin' Sandy," she said.

Sandy sat down, took off his boots and then got up and resumed his piping in his stockinged feet.

* * * *

Shop Assistant: "Wonderful value, sir. Worth double the money. Latest pattern, fast colours, hole-proof, won't shrink, and it's a good yarn."

Customer: "Yes, and very well told."

* * * *

Teacher: "Why does Mexican oil yield good petrol?"

Student: "I don't know, unless its because it has so many revolutions in it."

* * * *

Two tramps were looking at a plum tree with open mouths when suddenly a plum fell into the mouth of one of them.

"Lumme," said the other, "you're lucky."

"Ay," said he into whose mouth the plum had fallen. "but I've got to chew it yet."

* * * *

Boy: "Please, sir, how much are the rock cakes?"

Baker: "Penny each, or two for three-half-pence."

Boy: "Oh, I'll have the half-penny one, please!"

* * * *

Miss Gushin: "It must be thrilling to be a parachute jumper. Have you had any outstanding experiences?"

Jumper (Fed up): "Yes, miss; I once landed on a place where it said 'Keep off the grass."

* * * *

Traffic Policeman (to professor of mathematics): "So you saw the accident, sir. What was the number of the car that knocked him down?"

Professor: "I'm afraid I've forgotten it, but I remember noticing at the time that if it were multiplied by 50, the cube root of the product would be equal to the sum of the digits."

* * * *

SHOCK TACTICS

The auctioneer was holding up a pair of silver candlesticks. "Give me a start!" he cried.

"Fourpence," said a bidder.

"What!"

"Ah!" said the bidder, "I thought that would give you a start!"

We have a letter on our file, the writer of which tells us that in 1903, 32 years ago, he mended two completely smashed vases with Seccotine. The vases, he says, are still in use, although kept in all sorts of atmospheres during these years and for six months at one time actually stored in a damp cellar.

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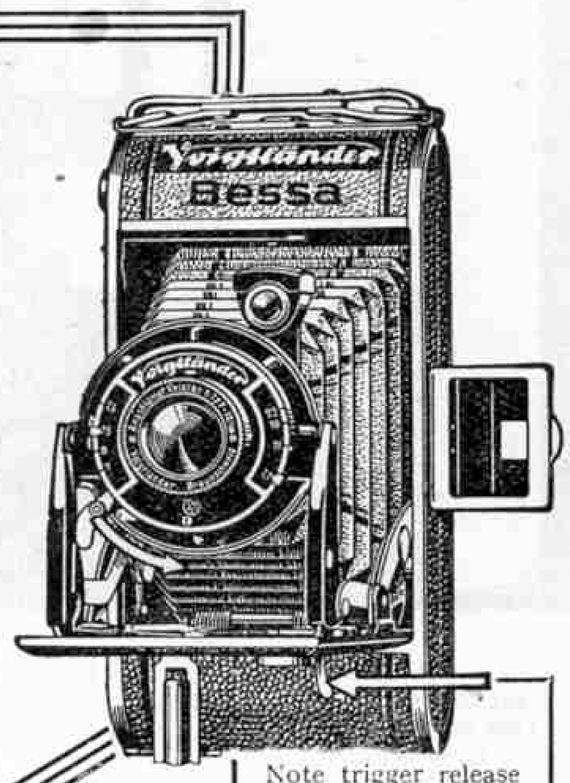

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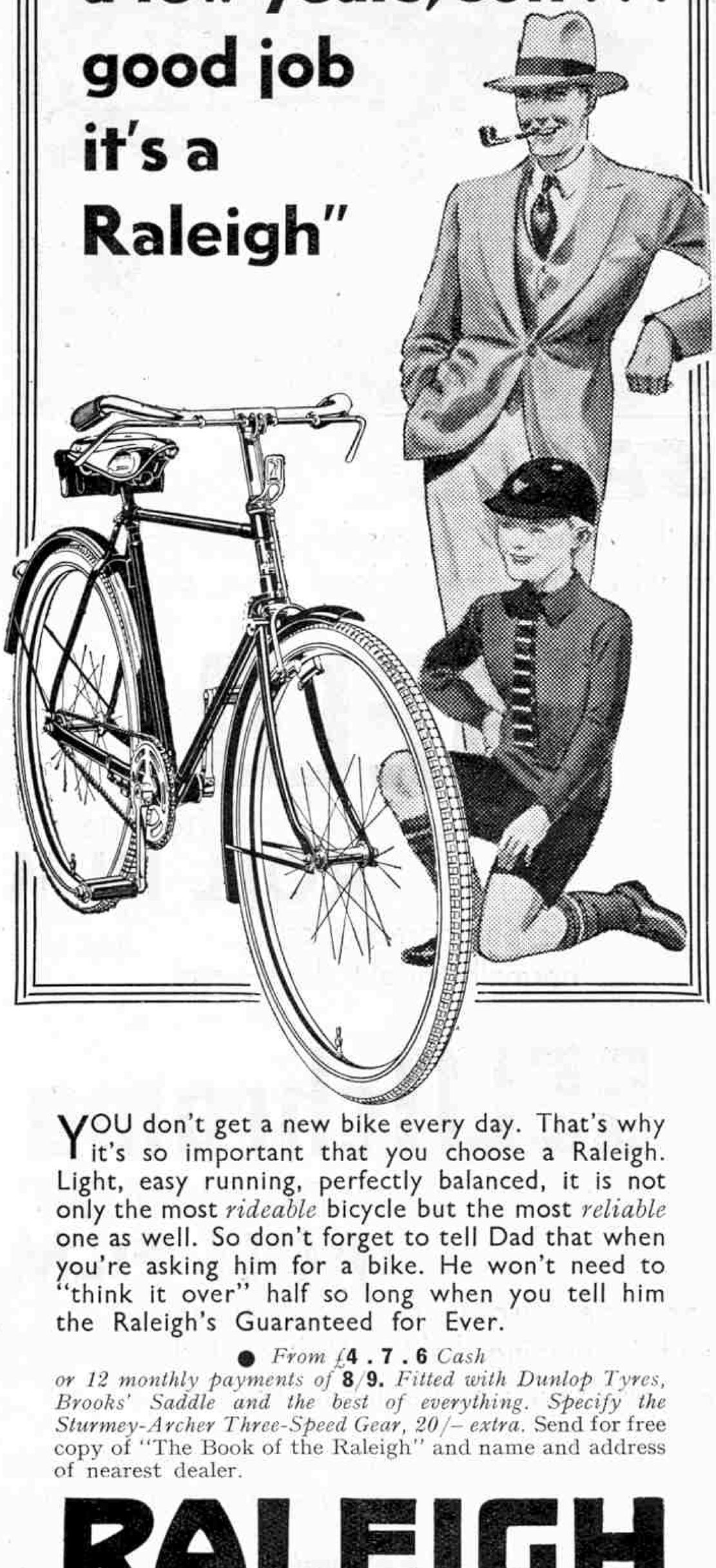

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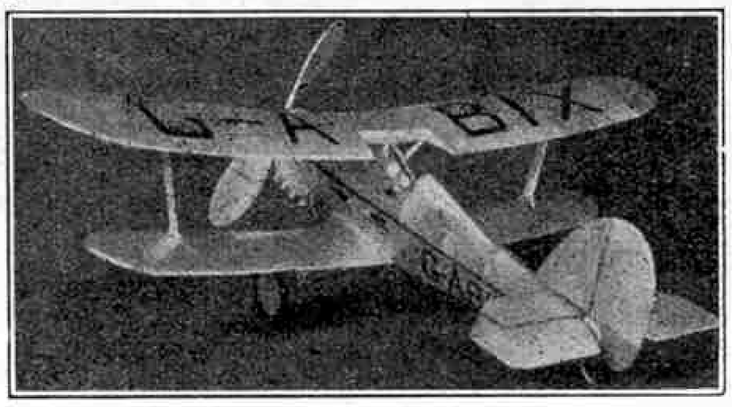

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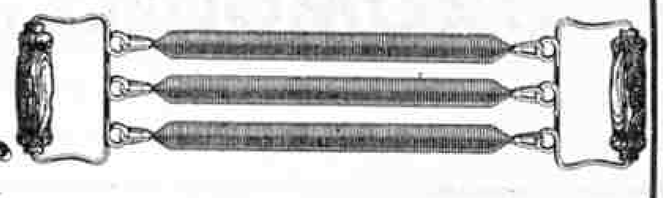

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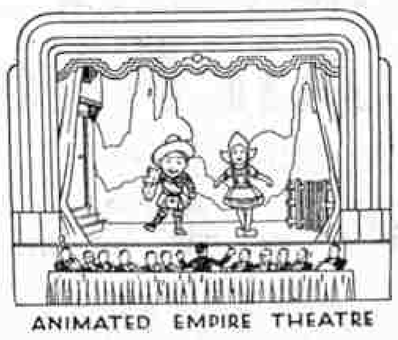

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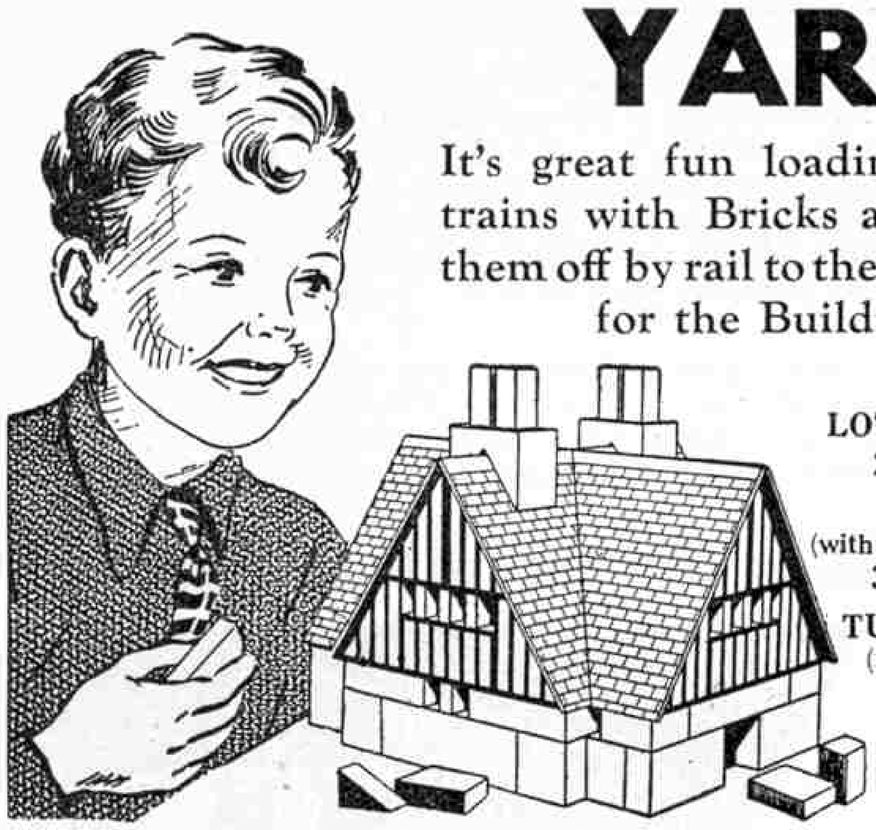

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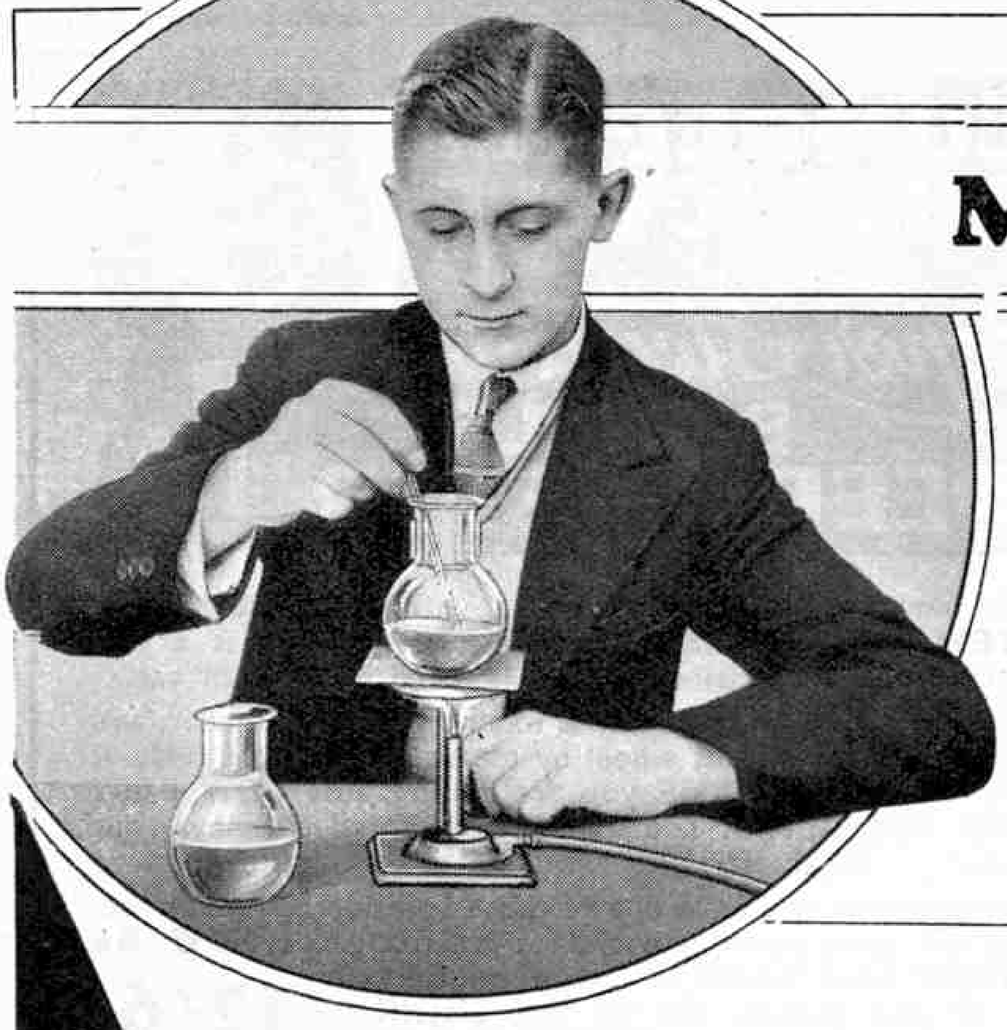

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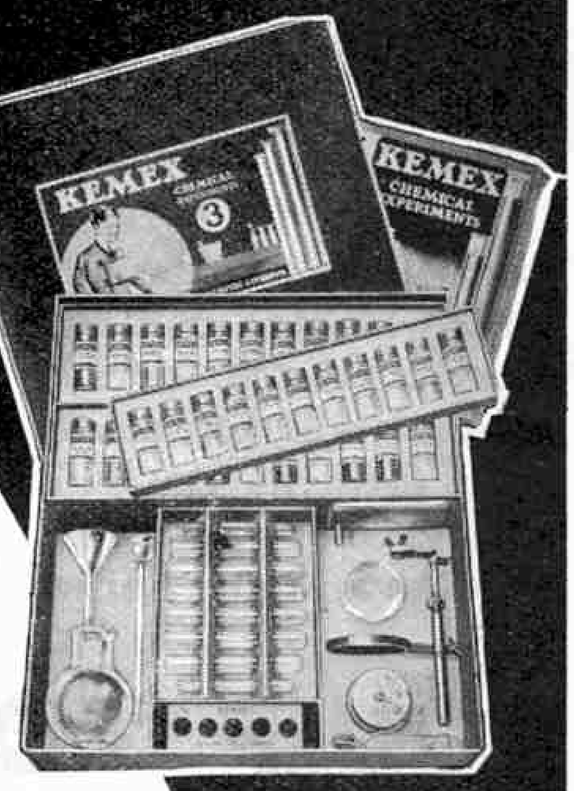

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20.	Flanged Wheels, 1⅛" diam. ,,	0	5
20b.	,, ,, ¾" ,, ,,	0	3
	Pulley Wheels		
19c.	6" dia. with centre boss and set screw ... ... each	1	9
20a.	2" ,, ,, ,, ,,	0	4
21.	1½" ,, ,, ,, ,,	0	4
22.	1" ,, ,, ,, ,,	0	3
23a.	½" dia. with centre boss and grub screw ... ... ,,	0	3
22a.	1" dia. without centre boss and grub screw ... ... ,,	0	2
23.	½" ,, ,, ,, ,,	0	2
24.	Bush Wheels ... ... ,,	0	4
26.	Pinion Wheels, ½" dia., ½" face ,,	0	4
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26b.	,, ,, ½" ,, ¾" ,, ,,	0	6
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28.	Contrate Wheels, 1½" diam. ,,	0	9
29.	,, ,, ¾" ,, ,,	0	6
30.	Bevel Gears, ¾", 26 teeth ... ,,	0	7
30a.	,, ,, ½", 16 ,, ... ,,	0	6
30c.	,, ,, 1½", 48 ,, ... ,,	1	6
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119.	Channel Segments (8 to circle, 11½" diam.) ... ,,	0	4
123.	Cone Pulley ... ... ,,	1	3
124.	Reversed Angle Brackets, 1" ½ doz.	0	4
125.	,, ,, ,, ½" ,,	0	3
126.	Trunnions ... ... pair	0	3
126a.	Flat Trunnions ... ... each	0	1
129.	Rack Segments, 3" diam. ,,	0	5
132.	Flywheels, 2¾" diam. ... ,,	2	0
133.	Corner Brackets, 1½" ... ,,	0	1
133a.	,, ,, 1" ... ,,	0	1
137.	Wheel Flanges ... ... ,,	0	3
139.	Flanged Brackets (right) ... ,,	0	2
143.	Circular Girders, 5½" diam. ,,	1	0
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154a.	Corner Angle Brackets, ½", right hand ... ... ½ doz.	0	6
154b.	Corner Angle Brackets, ½", left hand ... ... ,,	0	6
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161.	Girder Brackets, 2"x1"x½" 2 for	0	3
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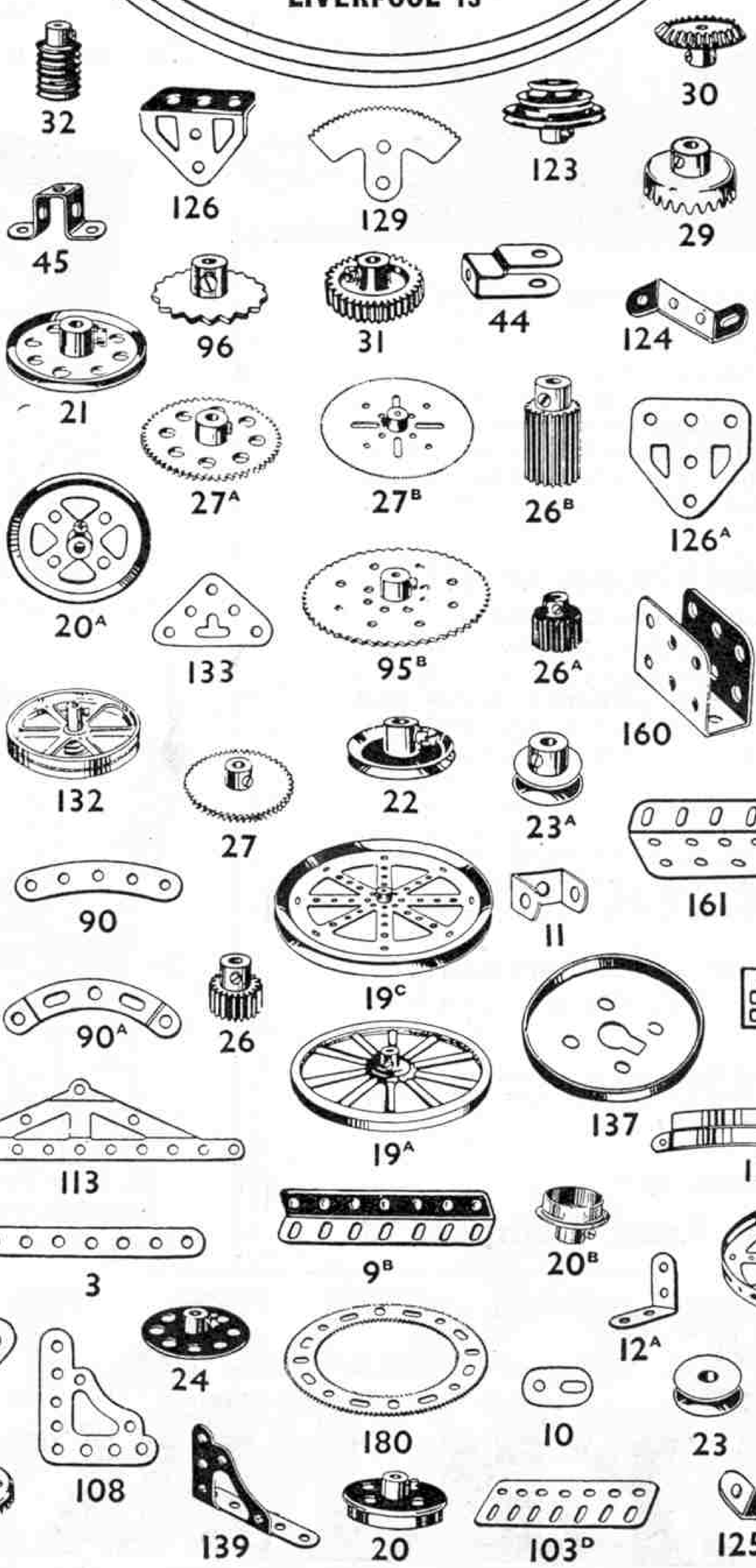
170.	Eccentrics, ½" throw ... ,,	0	9
180.	Toothed Gear Ring, 3½" diam. {133 external teeth / 95 internal ,,} ,,	2	0



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D	,,	...	...	...	,,	15/–	Da	,,	D	,,	,,	E	,,	5/6
E	,,	...	...	...	,,	20/–	Ea	,,	E	,,	,,	F	,,	11/–
F	,,	...	...	...	,,	30/–	Fa	,,	F	,,	,,	G	,,	26/6
G	,,	...	...	...	,,	55/–	Ga	,,	G	,,	,,	H	,,	17/6
H	,,	(Carton)	...	...	,,	72/6	Ha	,,	H	,,	,,	K	,,	60/–
Hw	,,	(Cabinet)	...	...	,,	97/6	Ka	,,	K	,,	,,	L	,,	225/–
K	,,	(Carton)	...	...	,,	132/6								
Kw	,,	(Cabinet)	...	...	,,	157/6								
L	,,	(,,)	...	...	,,	410/–								

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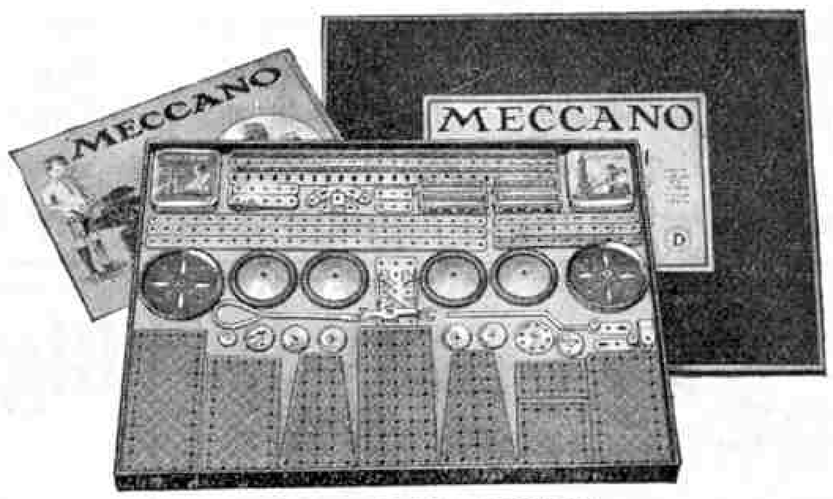
A Meccano Outfit. Price 5/–



D Meccano Outfit. Price 15/–

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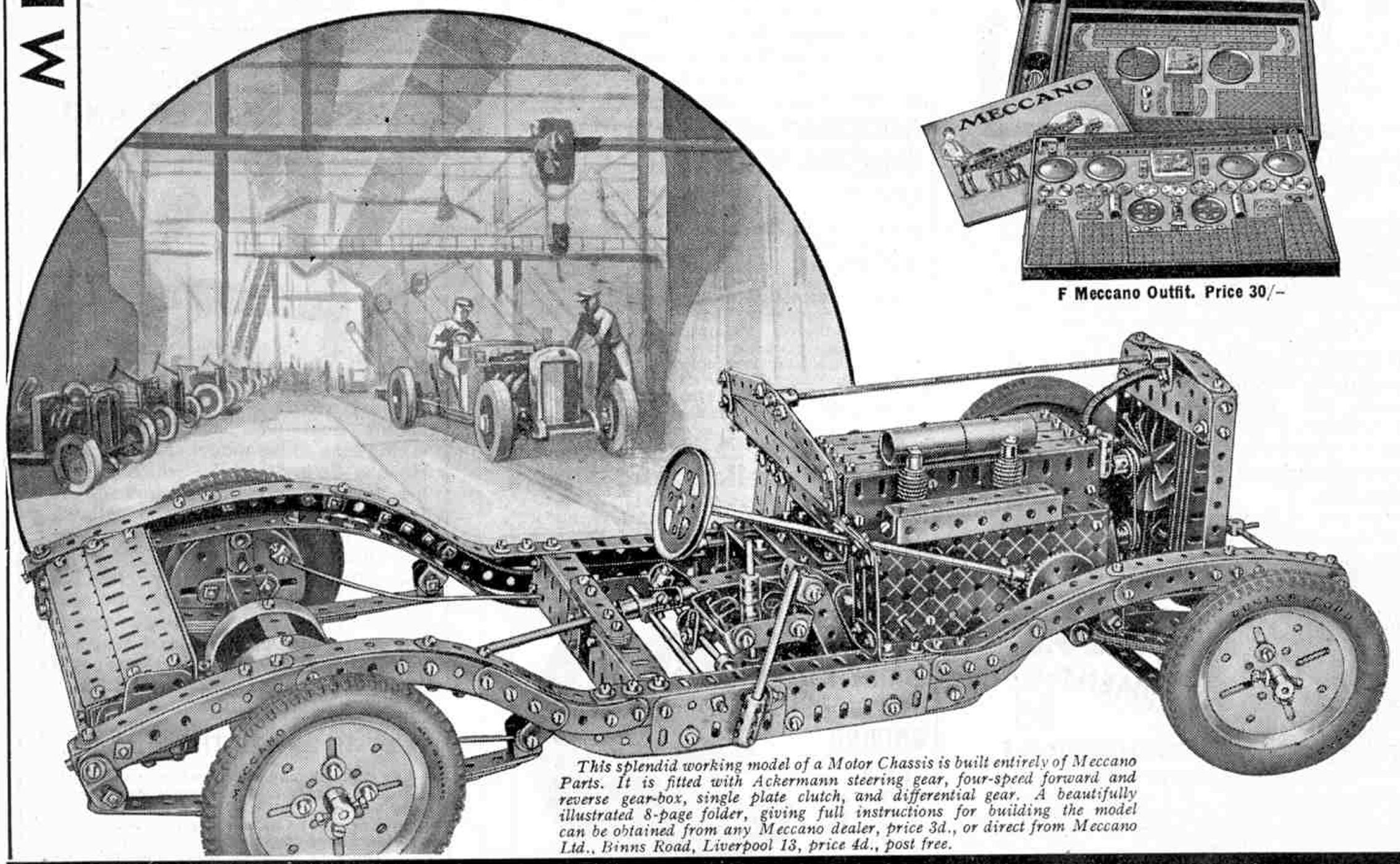

This splendid working model of a Motor Chassis is built entirely of Meccano Parts. It is fitted with Ackermann steering gear, four-speed forward and reverse gear-box, single plate clutch, and differential gear. A beautifully illustrated 8-page folder, giving full instructions for building the model can be obtained from any Meccano dealer, price 3d., or direct from Meccano Ltd., Binns Road, Liverpool 13, price 4d., post free.

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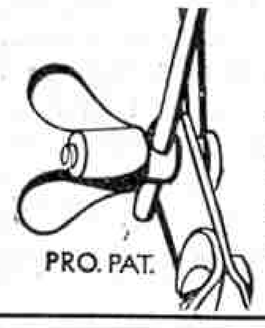

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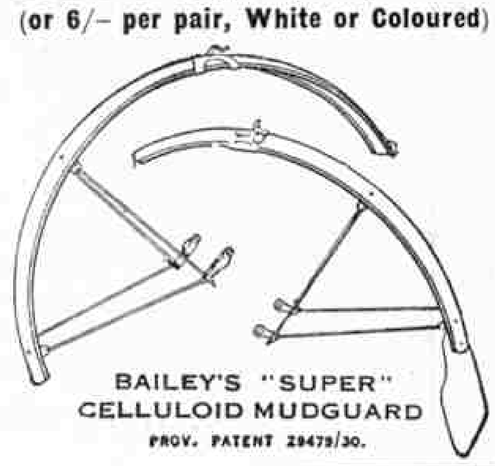

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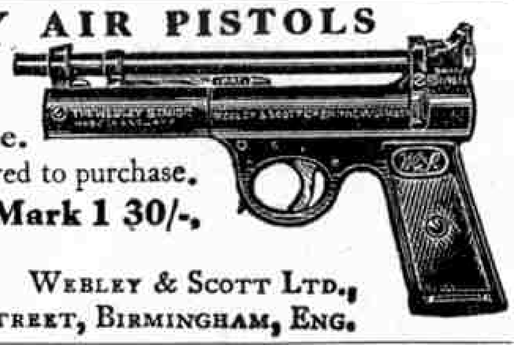

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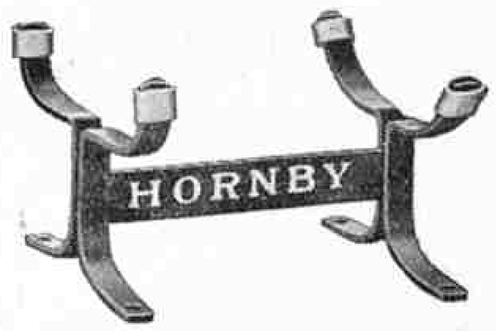

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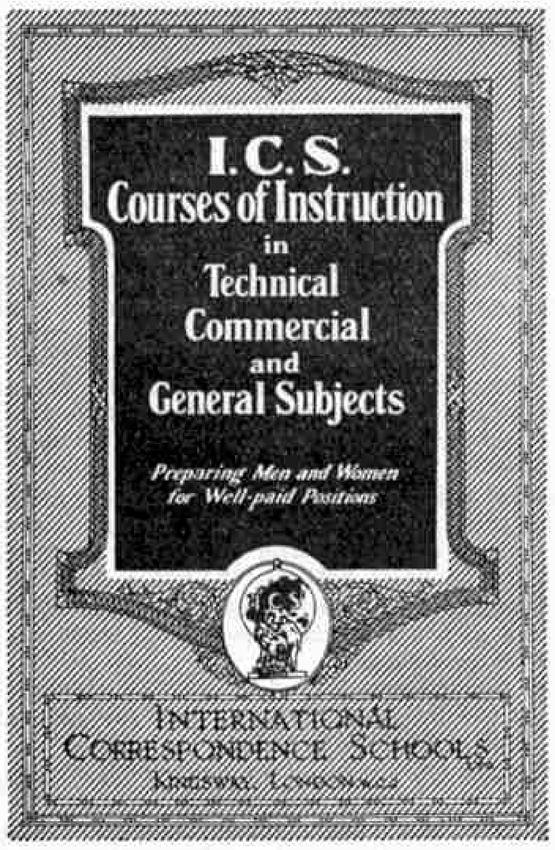

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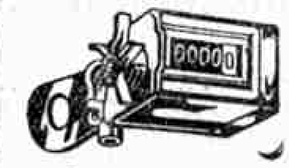

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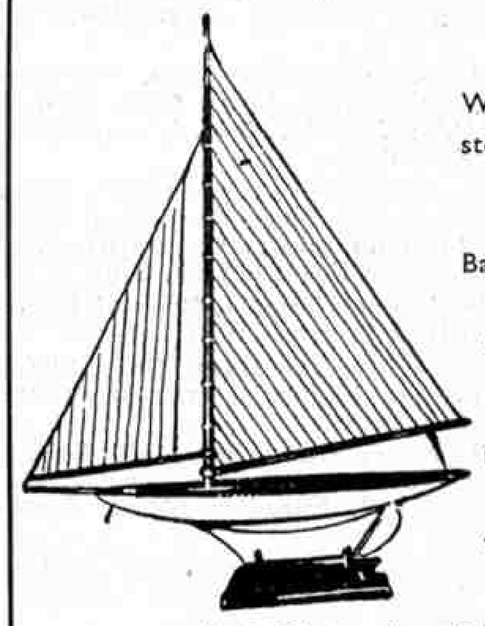

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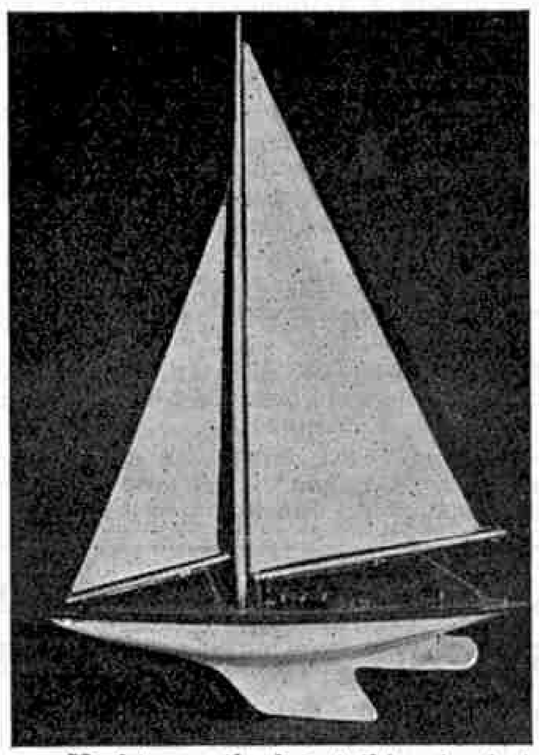

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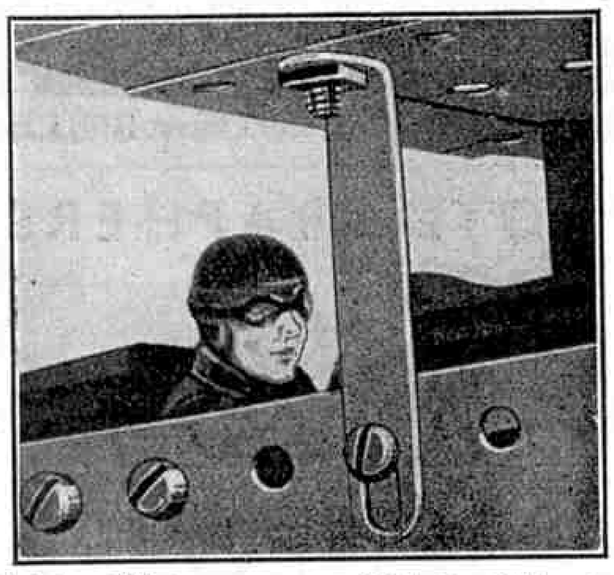

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Telegrams: "Meccano, Liverpool."

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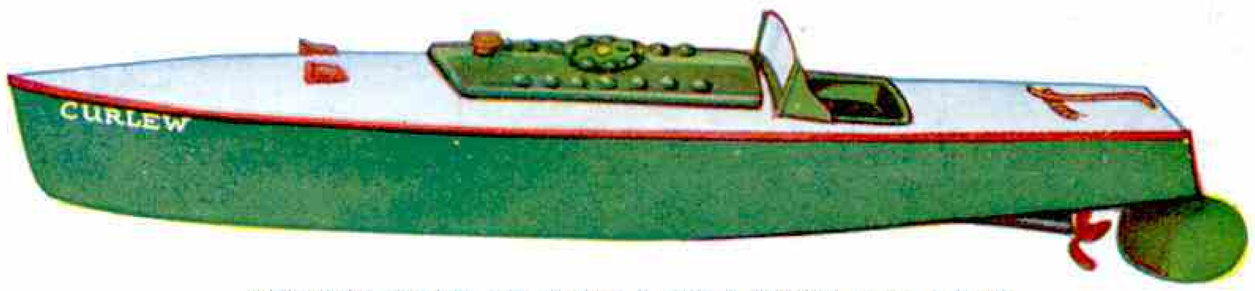

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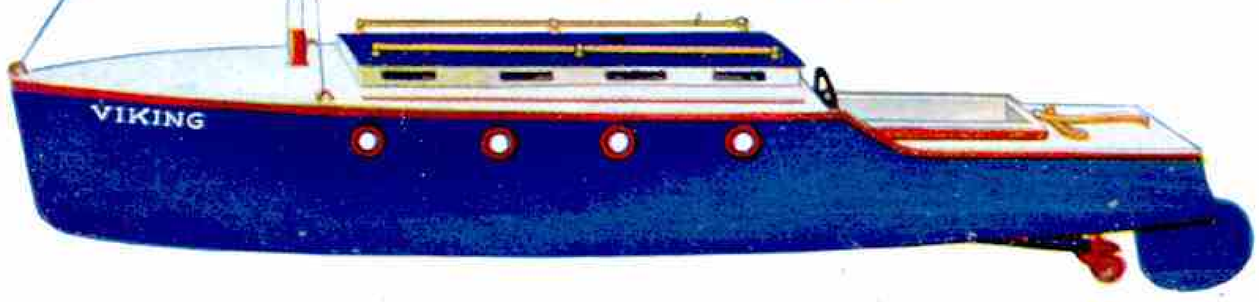
Travels over 500 ft. on one winding. Dimensions: Length 16½ in. Beam 3½ in.

HORNBY RACING BOAT No. 3. "RACER III." Price **14/6**
Travels over 300 ft. at high speed on one winding. Finished in Red and Cream. Dimensions: Length 16½ in. Beam 3½ in.



HORNBY CABIN CRUISER No. 5. "VIKING." Price **16/6**
Travels over 500 ft. on one winding. Dimensions: Length 16½ in. Beam 3½ in.

This is the Hornby Speed Boat Club Badge, which may be purchased from your dealer, price 6d., or direct from us, price 6d., post free.

HORNBY SPEED BOAT CLUB

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